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MARY WIBEL, *Editor*

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The Measurement Of Sports Ability In High School Girls

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THE purposes of this study were (1) to investigate the possibility of predicting sports skills and abilities of high school girls by means of readily standardized tests, (2) to investigate test elements most closely allied to such sports skills, and (3) to investigate the relative importance of these various test elements.

The subjects used in this study were 155 girls in grades 10, 11, and 12, of North High School, Des Moines, Iowa. The age range was from 15 to 18 years, inclusive. All were students of the junior investigator, and all tests were administered by her. Only students engaged in regular physical education classwork were used. The group constituted a random sample of the girls in gymnasium classes in this high school.

CRITERION OF SPORTS SKILLS

The girls were rated as to their abilities in various sports skills, such as tennis, basketball, swimming, volleyball, and soft ball, by the junior investigator and by another woman teacher of physical education in that department.* Each investigator graded each girl, using the following seven-category scale:

+3—highly superior
+2—good
+1—slightly better than average
0—average
-1—slightly poorer than average
-2—poor
-3—very poor

The two teachers first rated each student independently and then discussed their ratings and made adaptations suggested by the results of their discussions. Two weeks later, without reference to the first rating, they repeated the procedure. The correlation of the sum of the ratings made the first week, but before their discussions, with those made during the third week was .90. The rating finally adopted was a compromise between the ratings made the first and those made the third week, and the final distribution of the ratings was as follows:

* Miss Norma Becker.

Class Interval	*Frequency*
+3	15
+2	37
+1	47
0	23
—1	20
—2	11
—3	2

Owing to the procedure followed, it is a little difficult to assess the actual reliability of the ratings. If the reliability of .90 were stepped up by the Brown-Spearman Prophecy Formula, the resulting reliability would be .95.

This high reliability is supported by the high multiple correlation obtained with a combination of seven variables .889 (see Table II). It is quite possible that this high reliability is partly spurious because of the fact that the two teachers had probably discussed their opinions of the girls before. But, in view of the above-mentioned high multiple correlation, it could not have been much lower than .90.

In addition to ratings of sports abilities, two other ratings were made in the same manner. The first of these was a rating of what was called "sports intelligence." By this is meant how quickly the individual learned new sports skills. The second was a rating of the "poise" of the individual. By this was meant posture, not only from the standpoint of how straight the individual stood, but also from the general impression given of balance and ease of standing.

The following tests were given to all of the girls:

1. *Figure-Eight Run.*—Four indian clubs were placed in a rectangle twelve by eighteen feet. The girls ran around these clubs in a figure-eight pattern. They made three round trips, and the time was taken with a stop watch.

2. *McCloy's "Blocks Test" of Multiple Response.*[5**]—This test, which can be conducted with very inexpensive equipment, is a test of the ability to make quick and adaptive responses.

3. *Sargent Jump.*—This event was administered in the usual way, using a wall chart. [6, p. 64]

4. *Side Step.* [6, pp. 85-6]—This event was so administered that the distance between the outside lines was five feet.

5. *Squat Thrusts for Ten Seconds.* [6, p. 84]

6. *Forty-Yard Sprint.*

7. *Standing Broad Jump.*

8. *Six-Pound Shot-Put from a Stand.* [6, p. 389]

** Numbers refer to bibliography at end of paper.

9. *Johnson Test of Motor Educability*[4]:

   a. *Hill Test of Motor Educability.*[3]—This test is a stunt test after the manner of the Brace Test and of the Iowa Revision of the Brace Test.

   b. *Brace Test,*[1] McCloy scoring.—In this test two points were given for success on the first trial and one point for success on the second trial.

   c. *Iowa Revision of the Brace Test.* [6, p. 70-77]

   d. *Brace Test, with original scoring.*[1]

   e. *Shuttle Run.* [6, p. 118]—The girls ran for fifteen seconds and were instructed to touch the floor with the hand over the end lines.

   f. *Cozens' Dodging Run around Hurdles.*[2]

   g. *Tests 1 to 7 of Thurstone's Tests of Ability to Visualize Spatial Relationships.****—The sum of the scores was used.

   h. *Sum of the scores of tests 8 to 11 of Thurstone's Tests of Ability to Visualize Spatial Relationships.*

   i. *Tests 1 and 2 of Thurstone Battery.*

   j. *General Motor Capacity Score.* [6, pp. 125ff.]

ANALYSIS OF DATA

Zero-order correlations were computed between all tests and ratings of sports ability. Other correlations between variables were computed as needed for partial or multiple correlations. Numerous partial correlations were then computed to cause some of the variables to "vanish" when others were held constant. The ones that vanished or showed lower partial correlations were then dropped from further use.†

The following tests were eliminated in the manner described above: the figure-eight run, the ten-second squat thrust, the forty-yard

*** These tests were as follows: (1) Flags, (2) Block Counting, (3) Mechanical Movements, (4) Punched Holes, (5) Lozenges A, (6) Lozenges B, (7) Hands, (8) Identical Forms, (9) Areas, (10) Pursuit, (11) Copying. These were tests of a preliminary research battery used by L. L. Thurstone at the University of Chicago in studies of mental function. They were created to measure the ability to visualize spatial relationships.

† For example, the pertinent correlations of the Sargent Jump and the standing broad jump were: Rating and Sargent Jump, .730; Rating and standing broad jump, .576; Sargent Jump and standing broad jump, .604. When the partial correlation of the rating with the standing broad jump, with the Sargent Jump held constant, is computed, the result is .238. The multiple correlation of the Sargent Jump and the standing broad jump, to predict the rating, is .748, as contrasted with the zero-order correlation of .730 with the Sargent Jump above. Clearly, the standing broad jump adds nothing significant to the Sargent Jump, and its own predictive power is much less.

sprint, the standing broad jump, the Johnson test, the Hill test, the Brace test with McCloy's method of scoring. the original Brace test,†† the shuttle run, and numbers eight to eleven of the Thurstone Battery. The remaining tests were then intercorrelated and studied further. All zero-order correlations are given in Table I.

The General Motor Capacity Score is the variable which has the highest correlation (.812) with the sports ability rating. This is, however, a combination of three tests, the Sargent Jump, the Iowa Brace test, and the ten-second squat thrust. A correlation of this size against a rating is one that is seldom found, and speaks well for the validity and reliability of the ratings.

The Sargent Jump has the second highest correlation (.730) with the ratings. It should be re-emphasized that this test should be given *only after adequate practice has been given* for the individuals to learn the form. Adequate practice was given in the present study, and the results confirm the high value attributed to the Sargent Jump as a measure of motor capacity.

The Brace test had the next highest correlation (.706) with the ratings, and as a *single test,* namely, even when not used in combination with other tests, is a valuable test item. It seems to be more of a *general* test of motor ability than a specific test of motor educability. The Hill test had a correlation of 690. with the ratings, the Iowa Brace, 682, and the Johnson test, 678. The original form of the Brace test, while having a slightly higher correlation with the criterion than the other forms did (.706) "went out" when other tests were held constant because of its higher intercorrelations with other variables; that is, other tests told more of the same thing than the Brace test told. Conversely, however, if only one test were to be used, the original Brace test is superior to either of the substitutes as a general test of motor ability. None of the other tests, except the Cozens dodging run, .656, had a high enough correlation with the criterion to be retained as a measure of sports ability.

Numerous multiple correlations were then tried in an attempt to find a combined measure more adequate than any one variable. These are shown in Table II.

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†† There was little significant difference between the stunt type tests. For example, partial correlations with the rating of the Iowa Brace, the original Brace, and the Johnson tests, with the Sargent Jump held constant, were: Iowa Brace, .540; Original Brace, .521; Johnson, .473. The Iowa Brace was retained for this study because of its slightly greater convenience (ten events to administer rather than twenty). There is little difference in the results, however.

TABLE I
ZERO ORDER CORRELATIONS

		K Sports Intelligence	P Poise	1 Figure 8 Test	2 Blocks	3 Sargent Jump	4 Side Step	5 Squat Thrusts (10″)	6 Sprint (40 yds.)	7 Standing Broad Jump
Sports Ability	O	.826	.738	—.547	—.527	.730	.594	.510	—.560	.576
Sports Intelligence	K	—	.701							
Poise	P	.701			—.246	.524				
Figure 8 Test	1			—			—.477	—.287		
Blocks	2	—.367	—.246		—	—.353	—.276			
Sargent Jump	3	.590	.524		—.353	—	.556	.366	—.544	.604
Side Step	4	.494		—.477	—.276	.556	—	.419		
Squat Thrusts (10″)	5	.527	.521	—.287		.366	.419	—		
Sprint (40 yds.)	6					—.544			—	
Standing Broad Jump	7					.604				—
Six pound Shot	8	.364			—.245	.444	.389			.459
Johnson Test	9	.661			—.449	.563	.530			
Hill Test	a					.531				
Brace Test {McCloy} {Scoring}	b	.668				.563		.294		
Iowa Brace Test	c	.618	.555		—.325	.494	.357	.488		.463
Brace Test	d	.671			—.491	.564	.545			
Shuttle Run	e			—.605	—.286	.623	.539	.430	—.575	
Cozens Dodging Run	f	—.512		.593	.327	—.536	—.430	—.703	.439	
Thurstone 1-7	g	.510	.409		—.289	.376	.249			
Thurstone 8-11	h				—.322					
Thurstone 1-2	i	.522	.397		—.382	.220	.241			
G.M.C.S.	j	.742	.708		—.349					

TABLE I (Cont.)
ZERO ORDER CORRELATIONS

8 Six pound Shot	9 Johnson Test	a Hill Test	b Brace Test (McCloy Scoring)	c Iowa Brace Test	d Brace Test	e Shuttle Run	f Cozens Dodging Run	g Thurstone 1-7	h Thurstone 8-11	i Thurstone 1-2	j G.M.C.S.
501	.678	.690	.668	.682	.706	.606	—.656	.510	.385	.476	.812
											.742
				.555				.409			.708
						—.605	.593				
—.245	—.449			—.325	—.491	—.286	.327	—.289	—.322		—.349
.444	.563	.531	.562	.494	.564	.623	—.536	.376			
.389	.530			.357	.545	.539	—.430	.249			
			.294	.488		.430	—.703				
						—.575	.439				
.459				.463							
—	.311			.405	.332		—.348	.181			
.311	—	.604	.648	.615	.632	.435	—.608	.527			
	.604	—	.679	.778	.700						
	.648	.679	—	.747	.937						
.405	.615	.778	.747	—	.764	.503	—.588	.342			
.332	.632	.700	.937	.764	—	.400	—.582	.367			
.	.435			.503	.400	—	.595	.243			
—.348	—.608			—.588	—.582	—.595	—	—.314			
.181	.527			.342	.367	.243	—.314	—	.563		.317
								.563	—		
.108	.495			.294	.338	.232	—.253	.788		—	.270
								.317		.270	—

TABLE II

Rs WITH SPORTS ABILITY

$R_{o.2348cfg}$	= .869	$R_{o.35c}$	= .829
$R_{o.234cfg}$	= .863	$R_{o.38c}$	= .825
$R_{o.2ij}$	= .878	$R_{o.2cfg}$	= .824
$R_{o.239cfg}$	= .874	$R_{o.28cf}$	= .817
$R_{o.23cfg}$	= .872	$R_{o.3c}$	= .800
$R_{o.23cf}$	= .869	$R_{o.2cf}$	= .800
$R_{o.3cfi}$	= .868	$R_{o.23}$	= .793
$R_{o.24cfg}$	= .856	$R_{o.2cg}$	= .793
$R_{o.238cf}$	= .856	$R_{o.3f}$	= .758
$R_{o.238c}$	= .854	$R_{o.78c}$	= .758
$R_{o.ij}$	= .854	$R_{o.38}$	= .756
$R_{o.23c}$	= .846	$R_{o.2g}$	= .647
$R_{o.3cf}$	= .835	$R_{o.78}$	= .634

The first two and the fourth and the fifth of these combinations, while interesting scientifically, involve too many variables to be widely used. From there on, however, the variables become fewer in number, and any combinations might well be chosen as a battery of tests to predict sports ability.

Special attention is called to $R_{o.ij} = .854$. This is the combination of the General Motor Capacity Score and tests 1 and 2 of the Thurstone Battery. This correlation is only .035 smaller than the largest correlation obtained and tells quite a number of specific things of interest to the physical educator about the individual. The combination $R_{o.2ij}$ is still better (R=.878) but it uses the Blocks test, which is very slow in administration.

The best two-test correlation (it should be remembered that the General Motor Capacity Score for girls is made up of three events) is composed of the Sargent Jump and the Iowa Brace test.

The Blocks Test comes into a great many combinations. It is, however, an individual test and one that cannot as yet be administered as a mass test. Hence it will probably continue for some time to be used only to study specific problems on small numbers of subjects.

No multiple regressions are given for the combinations shown in Table II. This will be left for further studies involving these and other variables. It may be said, however that several combinations seem to be useful. Of those not involving the Blocks test, the combination of Sargent Jump, Iowa Brace, Cozens dodging run, and the first two of the Thurstone spatial relationship tests seems to be the best. For general convenience and speed of giving the tests, the General Motor Capacity Score, while not the highest correlation, is a decidedly useful one, especially when combined with the test of spatial relationships.

TESTS RELATED TO SPORTS INTELLIGENCE

The zero-order correlations of the tests tried against the rating of sports intelligence are given in Table I. Here it will be seen that again the General Motor Capacity Score is the highest, with the original Brace test next, the Brace with McCloy scoring and the Johnson test not far behind. Again here the Brace test tends to be eliminated by its higher intercorrelations.*

The high correlation of this Sports Intelligence rating with the Sports Ability rating shows that the two have a high degree of common elements. It is extremely probable that those who are good at sports learn more about them, and, conversely, that those who understand the skills and strategy become more interested and practice enough to become more expert.

The multiple correlations tried are given in Table III. Tests identified by Roman numerals indicate Thurstone tests. Here the highest is the General Motor Capacity Score, the first two tests of the Thurstone Battery, and the Blocks Test, .805. The General Motor Capacity and the two Thurstone tests give the next highest correlation, .791. The others are as indicated in the table.

TABLE III

Rs With Sports Intelligence

$R_{k.2ij}$	= .805	$R_{k.9i}$	= .698
$R_{k.ij}$	= .791	$R_{k.2i}$	= .577
$R_{k.234cfi}$	= .785	$R_{k.29}$	= .559
$R_{k.3di}$	= .780	$R_{k.I\ II\ IV\ VI\ X}$	= .539
$R_{k.3ic}$	= .773	$R_{k.I\ II\ X}$	= .531
$R_{k.23ic}$	= .773	$R_{k.I\ II}$	= .522
$R_{k.39i}$	= .753	$R_{k.II\ IV\ V\ VI}$	= .492
$R_{k.ci}$	= .713	$R_{k.I\ V\ VI}$	= .477
$R_{k.2cg}$	= .708	$R_{k.IV\ V\ VI}$	= .374
$R_{k.cg}$	= .700		

CORRELATIONS WITH RATINGS OF POISE

The zero-order correlations with the variables tried are found in Table I. The multiple correlations are found in Table IV. Here again it is found that the General Motor Capacity Score rates very

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* If the Sargent Jump and Thurstone tests 1 and 2 are held constant, the partial correlations with Sports Intelligence ratings are:

Iowa Brace $R_{kc.3i} = .478$
Brace $R_{kd.3i} = .448$
Johnson $R_{kq.3i} = .337$

If Sargent Jump alone is held constant, the partial correlations with Sports Intelligence ratings are:

Iowa Brace $R_{kc.3} = .509$
Brace $R_{kd.3} = .507$
Johnson $R_{kq.3} = .493$

Here again the differences are not great and either might be selected.

highly and that the addition of the first two tests of the Thurstone Battery raises it considerably. Obviously the element of *poise* is high in girls with high motor ability generally.

TABLE IV

MULTIPLE CORRELATIONS WITH POISE

$R_{p.ij}$	= .740	$R_{p.3c}$	= .624
$R_{p.j}$	= .708	$R_{p.I\ II\ IV\ V\ VI}$	= .429
$R_{p.3ci}$	= .662	$R_{p.I\ II\ V}$	= .414
$R_{p.3cg}$	= .647	$R_{p.I\ II}$	= .397

DISCUSSION

1. In an analysis of the results of this study, it is seen that the variables most highly correlated with sports ability are the Sargent Jump, which is primarily a measure of power, and the various forms of the Brace test and the Johnson test.

2. The ability to change direction, particularly as measured by the Cozens' dodging run, contributes a good deal, and this contribution is in addition to the power expended ($r_{of.3} = .458$).

3. Tests of what is frequently called motor educability, as measured by any varieties of the Brace test or by the Johnson test, are also exceedingly useful. The Iowa Revision was selected in this study because it combined a little more favorably with the other tests, giving slightly higher multiple correlations. Any one of them, however, is satisfactory. The same was true of the Johnson test, but the fact that it is an individually conducted test makes it much slower to administer than the stunt type tests.**

4. The ability to make quick and adaptive motor responses also seems to be an important part of the abilities making up this general sports ability. In the present study, this ability is measured by the Blocks Test.

5. The ability to visualize spatial relationships, as measured by the paper and pencil tests developed by Thurstone, was next in contribution. The recent simplified version of this test which can be obtained through Professor L. L. Thurstone, Department of Psychology, University of Chicago, is known to be highly indicative of this ability and can probably be used with confidence as a substitute for the tests used in this study which are at the present time no longer available. Other experiments with this type of test have

** According to the study by Kobb (see reference 6, page 78) and several other unpublished studies, the Johnson test tends to be the best of the tests of motor educability in the learning of tumbling stunts, and if its administration could be simplified, it could become more widely used. This whole field of motor educability tests, however, is in need of much more study.

indicated that they measure what we may call "athletic smartness" with a high degree of accuracy.

The track and field events largely partialed out when the Sargent Jump and the Cozens' dodging run were held constant. Further experiments should be made with the shot put which did not entirely disappear when partialed and which has been found in other studies to be an excellent test for purposes of classification into homogeneous groups.[6] pp. 389-94.

No attempt has been made to simplify these batteries for practical use. The study, as reported here, is still in the stage of relatively pure science research. Further work needs to be done to simplify the Blocks Test and reduce it to a mass paper and pencil test form and further experimentation needs to be done on the tests of spatial relationships to adapt them specifically to use with sports, and to standardize their scores for this purpose.

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The JCR Test

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INTRODUCTION

THE JCR Test is a three-item test consisting of the vertical jump, chinning with the natural grip, and a 100-yard shuttle run in which the subject covers a ten-yard course ten times with the aid of bankboards to assist him in making the 180-degree turns. The test is essentially a performance test. It purports to measure the ability of an individual to perform fundamental motor skills such as jumping, climbing, running, and dodging which involve the basic elements of power, strength, speed, agility, and endurance. It purports to measure "total" ability and not to measure, in themselves, any of the basic elements underlying "total" ability.

The JCR Test may be of value as a supplement to the medical examination in the classification of adult males for participation in the physical education program designed to develop physical condition and fundamental motor skills. It may also have value in the motivation of students to higher levels of performance and may be a useful tool in the evaluation of training programs.

The JCR Test has proved to be extremely practicable for classification purposes when it has been necessary to test large numbers of men in relatively short periods of time. When so used, it has been found to be highly reliable and to indicate, to a moderately high degree, performance on a 17-obstacle, 670-yard obstacle course, and performance on the Army Air Forces Physical Fitness Test which has been shown to correlate highly with a 15-variable criterion of physical fitness. Combinations of essentially identical test items have been shown in analyses of data from other studies to indicate to a relatively higher degree, performance on 25-variable and 19-variable criteria. Because of its relatively high correlation with these criteria which demand "all-out" performance, the JCR Test can be administered early in the training program to predict such performance without unduly over-taxing untrained individuals in order to achieve the same results.

This paper discusses the development of the JCR Test, its reliability and validity, describes the test battery, outlines steps to be taken in the preparation for and administration of the test, and presents scoring tables for use with adult males.

DEVELOPMENT OF THE TEST

The JCR Test in its original form was developed in December,

1941, by the writer at Headquarters, Gulf Coast Air Corps Training Center, Randolph Field, Texas, where it was known as the JCR Motor Test. The JCR Motor Test consisted of the vertical jump, chinning with the natural grip, and a 100-yard shuttle run in which the runner ran the same five-yard course twenty times without the aid of bankboards in making the 180-degree turns. The run was performed on a hard surface and consisted of shuttling back and forth between two lines five yards apart.

At Randolph Field, the test was developed in response to the request for a fitness test which would be practical and which could be used at all levels of training in the command as an essential tool in the conduct of the physical training program for Air Corps cadets. In the development of the test the following steps were taken: (1) a comprehensive review of physical fitness test literature was made, (2) interviews were held and correspondence was exchanged with recognized leaders in physical fitness research, (3) the opinions of Air Corps physical directors who later would be directed to use the test were solicited, (4) the standardized "physical fitness" test most nearly satisfying the requirements placed upon it was selected and modified to produce a test which, on *a priori* grounds, would appear to measure in the most practical manner the type of fitness which the Air Corps program was attempting to develop in its air crew personnel.

Larson's Chinning, Dipping, and Vertical Jump Test[5]* was the test chosen as most nearly meeting the requirements (1) that it measure over-all ability to perform fundamental motor skills, (2) that it be a reliable measure of this ability, (3) that it have few test items and that it be simple to administer, (4) that it not require elaborate or expensive testing equipment, (5) that it be subject to administration indoors, and (6) that it be of the nature not to alienate new men being introduced to the physical training program through the medium of a physical fitness test.

In modifying Larson's three-item test to produce the JCR Motor Test, the dipping test was replaced by the 100-yard shuttle run essentially because it was the consensus that running should constitute a greater proportion of any criterion of Air Corps fitness than it did in Larson's 25-variable criterion in which only two items were running tests. The shuttle run was preferred to the dodging run, an item in Larson's five-item indoor test,[6] because it could be administered readily in a standard Army barracks.

Experience in the individual administration of the JCR Motor Test to approximately 13,000 men at twenty-three installations of the Gulf Coast Air Corps Training Center from January to May,

* Superior figures refer to selected references at the end of the paper.

1942, pointed to the need for devising a simplified and more direct means for measuring the difference between the standing and jumping reaches in the vertical jump, and for developing aids to assist runners in making the turns in the shuttle run. Therefore, when again faced with the problem of selecting a test of physical fitness for the Army Air Forces Officer Candidate and Officers Training School at Miami Beach, Florida, in December, 1942, the writer set about devising an adjustable score board for observing performance in the vertical jump and bankboards to be used in running the shuttle run. In experimenting with the use of bankboards for shuttle runs of various distances, the 20 x 5-yard run was modified to require running a ten-yard course ten times (10 x 10-yard run) in order to produce a run more closely simulating the dodging run of Larson's five-item test.**

This revised JCR Test, then, with the adjustable score board for the vertical jump and bankboards for use with the 10 x 10-yard shuttle run, is the test described in this paper. In its revised form, it was used, with age, to supplement the medical examination in the classification of approximately 8,000 officer candidates and student officers undergoing training at the Miami Beach Army Air Forces Officer Candidate and Officers Training School from January to July, 1943. The use of the test was discontinued in July, 1943, after the adoption by Headquarters, Army Air Forces, of the three-item official Army Air Forces Physical Fitness Test which was prescribed for use in all Army Air Forces installations.[7]

TEST RELIABILITY

Strictly speaking, reliability in this paper has reference to reproducibility, i.e., consistency in test results as indicated by the zero-order correlation coefficient (thereinafter referred to as r) computed from test and retest scores on a given population. JCR Test reliability is based upon two studies which are here reported. Both studies involved officer candidates at the Army Air Forces Officer Candidate School at Miami Beach in the spring of 1943. Both involved testing large numbers of individuals in short periods of time, in the manner described later in this paper; men were tested at the rate of from three to four hundred per hour. Both studies used four vertical jump standards, four chinning bars, and eight running lanes for the 10 x 10-yard shuttle run. With the exception of the examiner and timer, all assisting in the administration and scoring of test items were officer candidates trained to assist in the testing.

In the first study, 270 officer candidates of Class 1943-D were tested and retested four days apart. The population was divided into two equal groups of 135 men each. Group A was tested and retested in the mornings, Group B in the afternoons. Reliability

** Refer to Table I for evidence of greater similarity.

r's obtained on Groups A and B for the jump, chin, run and JCR score are shown below:

	Jump	*Chin*	*Run*	*JCR Score*
Group A	.89	.92	.80	.91
Group B	.89	.95	.81	.94

In the second study, 141 officer candidates of Class 1943-F were tested upon entrance and retested in their fourth, fifth, and sixth weeks of training at OCS. On all *re*tests, subjects were administered the jump, chin, and run, and again the jump, chin, and run in that order. JCR Test scores on these six-item *re*tests were computed by averaging the two three-item JCR Test scores. The *r* obtaining between the JCR Test upon entrance and the first JCR Test of the first *re*test four weeks later was .91 (N = 117). The *r* obtaining between the first and second JCR Tests, i.e., between the first three items and second three items, of the first *re*test, was .92 (N = 122). The *r* obtained between the two JCR Tests of the first *re*test (the test actually doubled) and the two JCR Tests of the second *re*test one week later was .95 (N = 108); that obtained between the two JCR Tests of the second *re*test and the two JCR Tests of the third *re*test was .97 (N = 84).***

TEST VALIDITY

Evidence for JCR Test validity is based upon four studies which are here reported. In the first two studies, data have been obtained from studies conducted (1) at Springfield College by Dr. Leonard A. Larson, now at New York University, and (2) at the United States Military Academy at West Point by Lloyd O. Appleton, professional assistant to the Master of the Sword at that institution. The last two studies were conducted by the writer at the Army Air Forces Officer Candidate School at Miami Beach.

The first evidence for JCR Test validity is in the relatively high positive correlation obtaining between it and the 25-variable criterion measure of motor ability reported by Larson in a previously published study.[6] Larson has reported in personal correspondence to the writer that a combination of the vertical jump, chinning with either grip, and dodging run shows a multiple correlation coefficient of .81 with the 25-variable criterion. Beta weightings are: jump, 2.4, chin, 3.3, and run, 1.0, computed by dividing all by the smallest beta. Zero-order intercorrelation coefficients are as follows:

	Chin	*Run*	*25-variable Criterion*
Jump	.35	.21	.61
Chin		.18	.70
Run			.34

*** These *r's* are not greatly different from what might be expected by use of the Spearman-Brown formula for predicting the reliability of a test of doubled length, namely, an *r* of .96 using .92 as the reliability coefficient of the three-item JCR Test. 8, p. 194

It is to be noted that these three items on which Larson reports differ from those items of the JCR Test in two respects: (1) the chinning in Larson's study is performed with either grip, not the forward grip, and (2) the run in Larson's study is the dodging run, not the 10 x 10-yard shuttle run. Supported by the following evidence, it seems reasonable to assume, however, that test items used by Larson correlate highly enough with those of the JCR Test to warrant considering Larson's findings as indicative of the validity of the JCR Test.

First, with respect to the difference in grips used, it is assumed that the grip used in Larson's study is not that used in the JCR Test (forward) for, in the writer's experience, most men given the choice of grips will use the reverse grip.† Therefore, to determine whether or not correlation between the two grips is sufficiently high to justify the replacement of the reverse by the forward in this claim for test validity, the writer made an analysis of some original data collected by Karpovich for a study conducted at the Army Air Forces School of Aviation Medicine in 1943.[4] In his study, Karpovich tested and twice retested more than 7,000 Army Air Forces aviation cadets who, after classification according to performance level in chinning, were divided at random into two groups for testing purposes.

The following *r's* were obtained where both Group A (N = 4057) and Group B (N = 3445) were tested, using the reverse grip, on a given day (R_1); three days later Group A was retested with the reverse grip (R_2) and Group B was retested with the forward grip (F_2); three days following this retest, Group A was tested with the forward grip (F_3) and Group B with the reverse grip (R_3):

Group A	$r_{R_1.R_2} = .795$	$r_{R_2.F_3} = .785$	
Group B	$r_{R_1.F_2} = .789$	$r_{F_2.R_3} = .779$	$r_{R_1.R_3} = .735$

Means and standard deviations of performances were as follows:

		1st *Reverse*	2nd *Reverse*	3rd *Forward*
Group A	M	9.45	10.90	8.52
	SD	3.29	3.37	3.09

		1st *Reverse*	2nd *Forward*	3rd *Reverse*
Group B	M	9.17	8.28	10.85
	SD	3.17	2.96	3.22

From the above *r's* it is observed that the correlation between the reverse grip and the forward grip is essentially equal to that ob-

† At least a partial explanation for this choice would appear to be in the fact that most individuals show greater performance with the reverse grip. DeWitt has shown that the mean number of chins performed with the reverse grip is 2.08 chins greater than the mean number of chins performed with the forward grip.1 Karpovich reports the difference ranging from two to three chins for performance levels from one to twenty chins.4

taining between the reverse grip and the reverse grip. Assuming that the reliability of the forward grip in this study is approximately equal to that of the reverse, the correlation between the true measures of the forward and reverse grips is extremely high, approaching theoretically perfect correlation.[8, p. 203] Therefore, with reference to the chinning item, it can be assumed that the substitution of the forward grip for the reverse grip in claiming validity for the JCR Test on the basis of Larson's findings is justified.

Second, with respect to the different run used in Larson's study, the *r* obtaining between the dodging run and the 10 x 10-yard shuttle run is not known. However, since the two runs, *a priori*, appear to test essentially the same elements underlying motor ability and, since both runs are, as shown in Table I, almost equal in difficulty, it would appear not too unreasonable to assume that the relationship between the two is sufficiently high to justify the replacement of the dodging run by the shuttle run in claiming validity for the JCR Test on the basis of Larson's findings. Apparently, the reduction in distance in the dodging run is compensated by the increased number of turns.

TABLE I

COMPARISON OF MEANS AND STANDARD DEVIATIONS OF THE DODGING RUN AND THREE VARIATIONS OF THE 100-YARD SHUTTLE RUN (a)

	Jump		*Chin*		*Run*		
	M	SD	M	SD	M	SD	*Run Description*
Springfield(b)	18.40	2.50	8.00	4.00	23.30	1.50	Dodging Run
West Point(c)	19.49	2.66	6.95	3.11	24.23	1.31	Dodging Run
AAF OCOTS(d)	18.97	2.69	6.79	3.20	23.67	1.53	10 x 10-yard with boards
AAF SAACC(e)	18.79	2.41	6.37	2.69	31.86	2.28	20 x 5-yard without boards
ASF ESPRI(f)	18.58	2.40	6.24	3.12	28.60	1.90	20 x 5-yard with boards

(a) Vertical Jump and Chinning statistics are provided to afford comparison of the different populations upon which data were obtained.

(b) Statistics are estimates from the T-Scores reported by Larson in his Scoring Table-Indoor Test.[6, p. 510]

(c) Statistics are from Appleton who obtained data for the West Point study described in the text.

(d) Statistics obtained by the writer at Army Air Forces Officer Candidate and Officers Training School, Miami Beach, spring, 1943. N = 3783, Age M = 28.37, Range = 18-45. JCR Test Scoring Tables (Table II) have been computed on this population and on the basis of these performances.

(e) Statistics obtained by the writer on entering Air Corps Cadets at San Antonio Aviation Cadet Center, Texas, spring, 1942. N = 4091, Age M = 22.82, Range = 18-27.

(f) Statistics obtained by the writer at Army Service Forces Enlisted School for Physical Reconditioning Instructors, Camp Grant, Illinois, July, 1944. N = 175, Age M = 27.08, Range = 18-39.

The second evidence for JCR Test validity is in the high positive correlation obtaining between it and a 19-variable criterion of physical

fitness consisting of the vertical jump, chins, dodging run, sit-ups (speed), softball throw, 300-yard run, dips, broad jump, rope climb, vault, Burpee (squat thrusts), total sit-ups, medicine ball put, push-ups, three broad jumps, flexion, extension, 50-yard dash, and endurance index—all items taken from accepted physical fitness tests. Data for this study were collected by Lloyd O. Appleton on 168 entering West Point Cadets in the summer of 1945. Mr. Appleton has kindly provided the writer with these data from which the latter has obtained a multiple correlation coefficient of .90 between a combination of the vertical jump, chinning, and the dodging run and the 19-variable criterion. The criterion measure represented combined standard scores for the nineteen items. Beta weightings are: jump, 1.0, chin, 1.2, run, 1.4, computed by dividing all by the smallest beta. Zero-order *r's* are as follows:

	Chin	*Run*	*19-variable Criterion*
Jump	.42	.43	.72
Chin		.34	.72
Run			.58

It is to be noted that the shuttle run of the JCR Test has been replaced by the dodging run in this validation study also. Therefore, the same assumptions made with respect to the run in the validation on the basis of Larson's data must be made here. In the chinning, however, similar assumptions are not necessary inasmuch as Appleton used the same grip (forward) prescribed in the JCR Test.

A third evidence for JCR Test validity is in the moderately high correlation obtaining between it and the AAF Physical Fitness Test. The AAF test is a three-item test consisting of sit-ups, pull-ups, and 300-yard shuttle run shown to correlate .86 (multiple correlation coefficient) with a 15-variable criterion consisting of tests of speed, endurance, power, agility, and body coordination.[7] In determining the relationship existing between the JCR and the AAF tests, both tests were administered to 490 officer candidates of the Army Air Forces Officer Candidate School in the spring of 1943. The mean age of the population was 27.39, the range, 19 to 45 years. Candidates were selected from three classes at random and were tested at the beginning, middle, and end of training. The AAF test was administered en masse, using eight chinning bars and eight running lanes; subjects were paired off and permitted to keep each other's scores. The JCR Test was also administered en masse as described in this paper, using four jump standards, four chinning bars, and eight running lanes; scores were recorded by assistants trained for the purpose. Shown below are the *r's* obtaining between the AAF and JCR scores at the three levels of training, and when scores obtained

at the three levels are combined. Corrected *r*'s indicating the highest theoretical *r*'s obtaining between the two measures are also shown.[8, p. 203] These assume the reliability *r's* of the AAF Test to be .85,[3] * and of the JCR Test to be .92.

Class	*N*	*AAF Test*	*JCR Test*	*Zero-order r*	*Corrected r*
1943-E	82	11th week	11th week	.59	.66
1943-F	270	7th week	6th week	.64	.72
1943-G	138	3rd week	1st week	.67	.72
Combined	490	Combined	Combined	.69	.78

A fourth evidence for JCR Test validity is in the relatively high correlation obtaining between it and performance on a 17-obstacle, 670-yard obstacle course. To discover this relationship, 390 officer candidates of the Army Air Forces Officer Candidate School, Class 1943-D (Age M = 26.78, Range 18-43), who had been administered the JCR Test, as described in this paper, upon entrance to OCS approximately four weeks earlier, were tested on the obstacle course. One hundred and thirty-nine of these, chosen at random, were retested on the course two days later in order to determine the reliability of the measure. Subjects ran the obstacle course in groups of four in order to provide competition and thereby control, insofar as possible, motivation to perform. Subjects had run the obstacle course several times during previous training, and on the day of its first administration were walked through the course before running it for time in order to become completely oriented to the rules governing competition.

The course consisted of vaulting, crawling, scaling a wall and ladder, jumping from heights, zig-zag running, rope climbing, and hurdling, and terminated with an approximate 200-yard run over irregular and sandy terrain. Mean time for the course was 268.34 seconds (approximately 4½ minutes), the standard deviation, 37.97 seconds. The reliability *r* obtained was .81.

The *r* obtaining between the obstacle course and the JCR Test administered four weeks earlier was .66; assuming reliability coeffi-

* It is the writer's impression that .85 is a high estimate of the reliability of the AAF Test as administered in this study, inasmuch as this was the first administration of the test at the Officer Candidate School, at a time when the test was still in an experimental stage and where testing was accomplished at the rate of approximately 400 men per hour. Low reliability would seem to be reflected in the *r* obtained between the AAF Test and the 17-obstacle, 670-yard obstacle course described later in the text with reference to validation of the JCR Test; the *r* obtained between the AAF Test and the obstacle course was .31 (N = 155). Knowing the criterion on which the AAF Test was validated and knowing the reliability of the obstacle course in this study to be .81 (see text), it is difficult to account for the low *r* between the two except in terms of low reliability of the AAF Test. If this low *r* is a reflection of lower than .85 reliability of the AAF Test, *r's* obtaining between the AAF and JCR Tests should be interpreted accordingly.

cients of .81 and .92 on the obstacle course and JCR Test respectively, the *r* corrected for attenuation was .76.[8, p. 203] The *r* actually obtaining between the two measures, with each measure representing an average of two performances, was .78 (N = 49).

THE TEST BATTERY

Item one: Vertical Jump

Procedure.—The subject stands with one side to a vertical wall and, with both feet flat on the floor, he reaches as high as he can with the hand nearer the wall. This height is marked. The subject then moves comfortably away from the wall and jumps, again reaching up the wall as high as he can. This second height is marked and the difference between the maximum standing reach and the maximum jumping reach is recorded to the nearest inch. Jumping is done from a hard and level surface which assures good footing.

Apparatus.—For scoring purposes, a dark colored wall, curtain, black-board, or similar suitable material is lined off horizontally in inches. The bottom line is approximately six feet above the floor. Chalk or water is used to mark heights. The board is cleaned for each new subject. A preferred method is to have the "score board" adjustable so that the bottom line can be adjusted to each subject's standing reach as shown in Figure 1. The standing reach is then "0" and the jumping reach is the actual difference between the standing and jumping reaches.

Scoring.—The difference to the nearest inch between the standing reach and jumping reach is the performance record. The best jump of three trials is recorded.

Points to observe: (1) that the subject's *standing reach is his maximum;* (2) that no extra hop, step, or jump is taken before the jump.

Item two: Chinning

Procedure.—The subject hangs from a horizontal bar and pulls himself up until his chin is above the level of the bar. He then lowers himself until the arms are straight. He is not permitted to kick, swing, or to rest. He continues at a moderate rate of speed to do the movements as long as possible. The forward grip (back of hands toward face, palms forward) is used.

Apparatus.—Chinning spaces can be constructed by running one- or one-and-a-quarter-inch pipe through four-inch by four-inch posts arranged in a straight line. The spaces should be from three to four feet wide and the bar eight feet above the ground. Steps should be

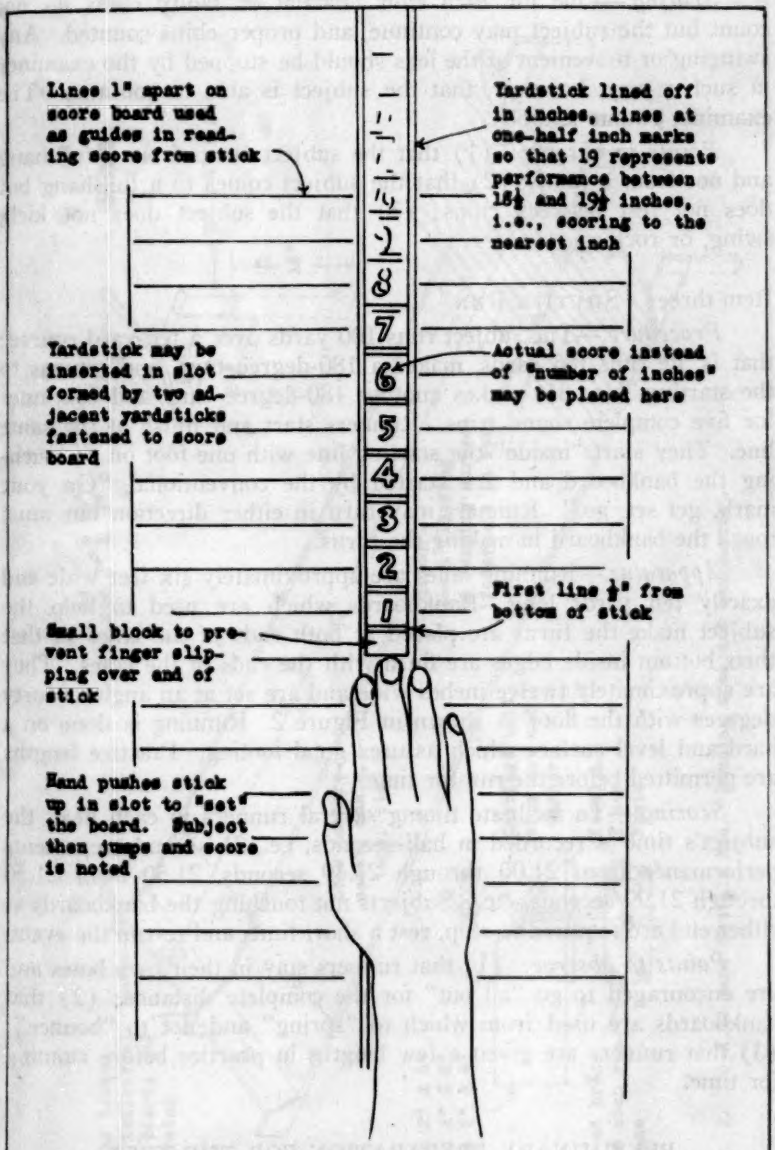
Lines 1" apart on score board used as guides in reading score from stick
Yardstick lined off in inches, lines at one-half inch marks so that 19 represents performance between 18½ and 19½ inches, i.e., scoring to the nearest inch
Yardstick may be inserted in slot formed by two adjacent yardsticks fastened to score board
Actual score instead of "number of inches" may be placed here
First line ½" from bottom of stick
Small block to prevent finger slipping over end of stick
Hand pushes stick up in slot to "set" the board. Subject then jumps and score is noted

Fig. 1. Vertical Jump Apparatus.

provided at each bar for those unable to jump and reach the bar easily.

Scoring.—One for each chin. Partial or faulty chins do not count but the subject may continue, and proper chins counted. Any swinging or movement of the legs should be stopped by the examiner in such a way, however, that the subject is able to continue. The examiner counts audibly.

Points to observe: (1) that the subject starts from a full-hang and not from a jump; (2) that the subject comes to a full-hang but does not rest between chins; (3) that the subject does not kick, swing, or rock up.

Item three: SHUTTLE RUN

Procedure.—The subject runs 100 yards over a ten-yard course; that is, he runs ten yards, makes a 180-degree turn, and returns to the starting line. He makes another 180-degree turn and continues for five complete round trips. Runners start and finish at the same line. They start "inside" the starting line with one foot on or touching the bankboard and are started by the conventional, "On your mark, get set, go." Runners may turn in either direction but must touch the bankboard in making the turns.

Apparatus.—Running lanes are approximately six feet wide and exactly ten yards long. Bankboards which are used to help the subject make the turns are placed at both ends of the lanes so that their bottom inside edges are flush with the ends of the lanes. They are approximately twelve inches wide and are set at an angle of forty degrees with the floor as shown in Figure 2. Running is done on a hard and level surface which assures good footing. Practice lengths are permitted before the run for time.

Scoring.—To facilitate timing several runners in each heat, the subject's time is recorded in half-seconds, i.e., 21 seconds represents performance from 21.00 through 21.49 seconds, 21.50 from 21.50 through 21.99 seconds, etc. Subjects not touching the bankboards at either end are required to stop, rest a short time, and re-run the event.

Points to observe: (1) that runners stay in their own lanes and are encouraged to go "all out" for the complete distance; (2) that bankboards are used from which to "spring" and not to "bounce"; (3) that runners are given a few lengths in practice before running for time.

PRELIMINARY PREPARATION FOR THE TEST

The following materials are needed for test administration and should be prepared for in advance:

1. Vertical jump apparatus, water, chalk, rags, etc.

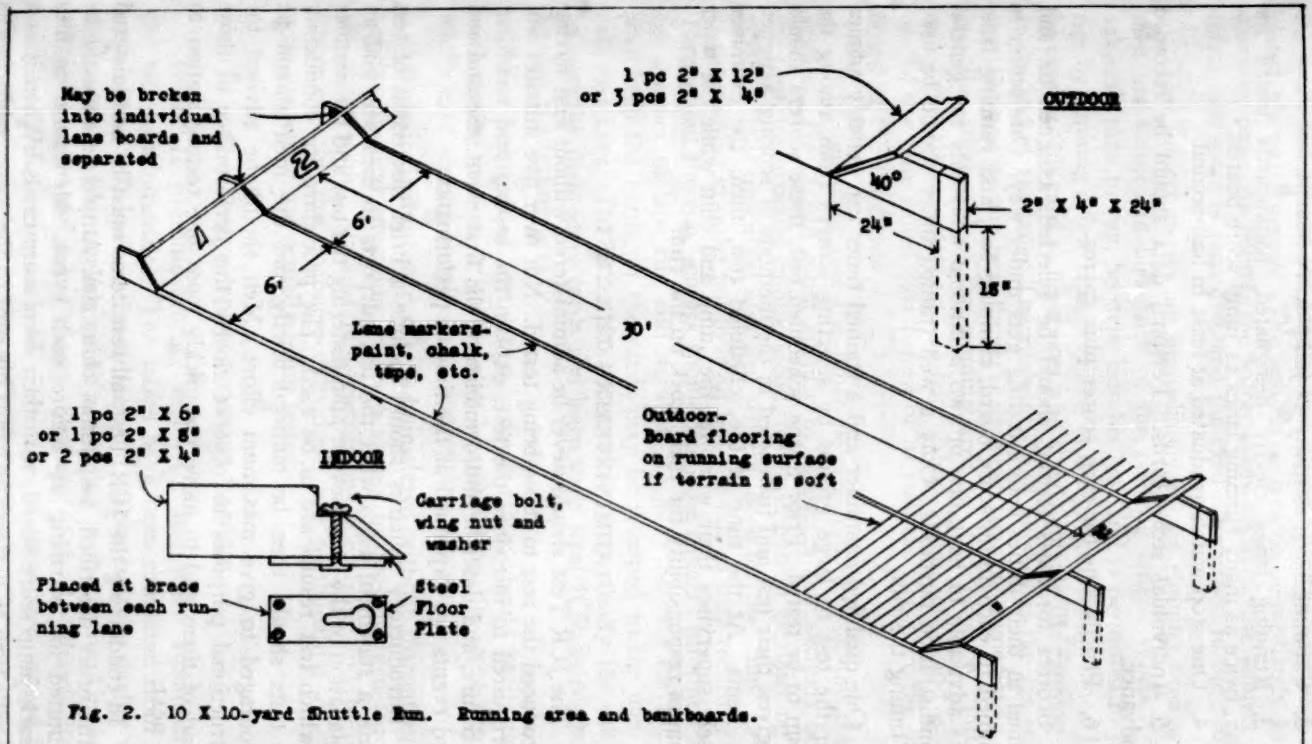
May be broken into individual lane boards and separated
1 pc 2" X 12" or 3 pcs 2" X 4"
OUTDOOR
40°
2" X 4" X 24"
24"
18"
6'
6'
30'
Lane markers- paint, chalk, tape, etc.
1 pc 2" X 6" or 1 pc 2" X 8" or 2 pcs 2" X 4"
INDOOR
Carriage bolt, wing nut and washer
Outdoor- Board flooring on running surface if terrain is soft
Placed at brace between each running lane
Steel Floor Plate

Fig. 2. 10 X 10-yard Shuttle Run. Running area and bankboards.

2. Chinning bars, as many as jump score boards.

3. Running lanes clearly designated, bankboards tested for safety, twice as many running lanes as jump score boards.

4. One stop watch graduated at least in half-seconds.

5. Individual score cards. Personal data should be recorded in advance.

6. Pencils, one for each scorer plus spares.

Scorers for mass testing should be selected, assigned to, and trained in their duties before testing gets under way. One scorer is assigned to each jump score board, chinning bar, and running lane. It is advisable to have one or two additional assistants for general administration purposes. Only a well trained timer should be used for timing the run.

One qualified examiner and a trained timer can reliably administer the test to large groups by selecting scorers from among the group to be tested. Prior to the scheduled test, these scorers should be given their test and instructed in the methods of scoring assigned test items. At the time of the scheduled test, then, the examiner closely supervises their work on the jump and chin while the timer assumes responsibility for their work on the run.

ADMINISTERING THE TEST

The JCR Test should never be administered without first having introduced the test to those being tested. Not over five minutes will be required to introduce the test, explain the testing and recording procedure, and describe and demonstrate the first event. Second and third events are explained at the time of performance.

Introductory remarks should include a brief discussion of test items, a statement as to what the test purports to measure, and an explanation of the purposes for administering the test and the manner in which test results are to be used. The procedure for conducting the tests should then be outlined briefly and the men should be encouraged to give maximum effort. Men should be advised for instructional purposes to observe closely the performance of those ahead of them and to move on quickly from one testing station to the next.

In conducting the JCR Test, all test items must be administered in the order described, i.e., jump, chin, run. Ample time should be permitted for warming up before each event. Men form in files at each jump score board, with their own score cards. When it is a subject's turn to perform he hands his card to the scorer who records

the score and returns the card to the subject after the latter has completed his performance. The subject moves on immediately to the chinning bars. As before, the scorer takes his card, the subject performs, the score is recorded, and the card is returned to the subject.

The subject moves on immediately to the running area where men are formed in files back of the running lanes. When it is a subject's turn to run, he steps into his lane and is permitted to practice by running a few laps, stopping at the *far* end of the lane. Here he presents his card to his scorer who stands outside the running area at the end of the lane. The run starts and finishes at the far end of the lane and as one heat finishes, the next runners immediately step into the other end of the running area to start practice. Time is called in half-seconds (e.g., 21-hup, 2-hup, 3-hup, etc.) and scorers record the time called just *before* or *as* runners step over the bankboard at the finish line.

It is important that the timer be well practiced in the correct rhythm. He should count silently to himself a few seconds before the time for actually calling aloud, to assist him in establishing this rhythm. It is important also that scorers listen for the "hup" as well as the number in order not to favor full seconds as they record scores. Throughout the run, scorers should keep the runners informed as to the number of laps run and number "to go." Scorers for the run may keep the cards, or the cards may be returned to the men and collected later. The latter procedure allows opportunity for subjects to examine their score cards and learn their total JCR scores before leaving the testing area.

For purposes of motivation, scoring tables should be posted at each testing station, or tables may be printed on the score card, in which case scorers simply circle appropriate scores.

If desired, the test can be administered without disrupting the regular physical education program simply by moving men through the three testing stations in a continuous file, from and to other activities. In this manner, individuals are participating in other activities while not actually being tested.

JCR TEST SCORING TABLES

Table II presents scoring tables for use when administering the test to adult males. The tables have been computed from data collected on 3,783 officer candidates and officer trainees during their first, sixth, and/or twelfth weeks in training at the Army Air Forces Officer Candidate and Officers Training School, Miami Beach, Florida, in the spring of 1943. The ages of these men ranged from 18 to 45 years with the mean at 28.37 years.

All scores have been determined by the cumulative frequency method of determining standard scores[2, p. 153] and are translated in terms of a six-standard deviation spread.[9, p. 396] That is, the score of 100 represents a performance approximately three sigma above the mean, 50 the mean, and 0 three sigma below the mean. Zero performance in chinning is credited 13 points in summing the three performance scores to derive the JCR score for, in reality, zero chins describes all performances greater than zero but less than one full chin (i.e., through .999), just as one chin describes all performances greater than one but less than two full chins (i.e., through 1.999), and so on.

Rating categories, established arbitrarily on the basis of present achievement, are presented for classification and motivation purposes. They do not necessarily represent what should be achieved for, to establish such norms, it would be necessary to take into account such factors as age, height, weight, body build, past training and other factors not considered in this study.**

Rating categories represent approximately the following:

Excellent—upper 10%
Good—next 20%
Average—middle 40%
Poor—next 20%
Very Poor—lower 10%

SUMMARY AND DISCUSSION

This paper has recorded the development of, discussed the reliability and validity of, and described procedures to be followed in the administration of the JCR Test, a three-item test of motor ability purporting to measure ability to perform fundamental motor skills. The test has been recommended primarily for the classification of adult males for participation in the physical education program designed to develop physical condition and fundamental motor skills.

Reliability coefficients ranging from .91 to .97, and validity coefficients ranging from .59 to .90 are reported for the test. Reliability and validity coefficients have been computed from data the majority of which have been collected in mass testing. The four different criteria on which the test has been validated can be said to demand "all-out" performance.

There are a few individuals who have contended that the JCR

** An r of —.375 has been obtained between the JCR Test and age, using as the population 85 upper class physical training officer candidates of the Army Air Forces Officer Candidate School, Class 1943-C. These men had all had physical education backgrounds prior to military service and when tested had had eight weeks' training at the OCS. Their ages ranged from 23 to 36 years with the mean age at 27.54 years.

TABLE II

JCR Test Scoring Tables

Jump	Chin	Run	JCR Sum*	Score	Rating	Jump	Chin	Run	JCR Sum*	Score	Rating
28	18	19	246	100		19	6	....	150	50	
....	....	....	243	99		....	....	....	147	49	
....	....	....	242	98		....	....	23.5	144	48	A
27	17	....	240	97		....	....	....	141	47	V
....	....	19.5	239	96		....	....	....	138	46	E
....	....	....	237	95		....	5	....	136	45	R
....	16	....	236	94		18	....	....	135	44	A
....	....	....	234	93	E	....	....	24	133	43	G
26	....	....	233	92		....	....	....	132	42	E
....	....	....	231	91	X	....	....	....	129	41	
....	15	20	228	90		....	....	....	126	40	
....	....	....	227	89	C	....	4	....	123	39	
....	....	....	225	88		17	....	24.5	120	38	
....	....	....	224	87	E	....	....	....	117	37	P
25	14	....	222	86		....	....	....	114	36	O
....	....	....	221	85	L	....	....	....	112	35	O
....	....	20.5	219	84		....	....	....	111	34	R
....	....	....	218	83	L	....	3	25	109	33	
....	13	....	216	82		16	....	....	108	32	
....	....	....	213	81	E	....	....	....	107	31	
24	....	....	212	80		....	....	....	105	30	
....	....	....	210	79	N	....	....	....	103	29	
....	12	21	209	78		....	....	25.5	102	28	
....	....	....	207	77	T	....	2	....	99	27	
....	....	....	206	76		15	....	....	97	26	
....	....	....	204	75		....	....	....	96	25	
23	11	....	203	74		....	....	26	94	24	V
....	....	....	201	73		....	....	....	93	23	
....	....	21.5	198	72		....	....	....	91	22	E
....	....	....	197	71		....	1	....	90	21	
....	10	....	195	70		14	....	26.5	88	20	R
....	....	....	194	69		....	....	....	87	19	
22	....	....	192	68	G	....	....	....	84	18	Y
....	....	....	191	67		....	....	....	82	17	
....	....	22	189	66	O	....	....	27	81	16	
....	9	....	188	65		....	....	....	79	15	P
....	....	....	186	64	O	13	....	....	78	14	
....	....	....	183	63		....	0	....	76	13	O
21	....	....	180	62	D	....	....	27.5	75	12	
....	....	....	177	61		....	....	....	73	11	O
....	8	22.5	174	60		....	....	....	72	10	
....	....	....	171	59		....	....	....	69	9	R
....	....	....	168	58	A	12	....	28	67	8	
....	....	....	167	57	V	....	....	....	66	7	
20	....	....	165	56	E	....	....	....	64	6	
....	7	....	164	55	R	....	....	....	63	5	
....	....	23	162	54	A	....	....	28.5	61	4	
....	....	....	159	53	G	11	....	....	60	3	
....	....	....	156	52	E	....	....	....	58	2	
....	....	....	153	51		....	....	29	57	1	
						10	....	29.5	54	0	

* Sum of scores for the jump, chin, and run.

Test itself does not demand enough of the subject in the way of "all-out" performance, that if a test does not "push" it is not a good performance test. The writer contends that because of its relatively high correlation with measures which do demand "all-out" performance, the JCR Test can be administered early in the training program to predict such performance without over-taxing untrained individuals in order to achieve essentially the same results. To administer to untrained men tests demanding, in themselves, "all-out" performance is not only physiologically unsound but it is observed that the practice is productive many times of measures which reflect the motivating factors operating upon individuals rather than their ability to perform.

Acknowledgments

The writer expresses his most sincere gratitude to Mr. James E. Pixlee and Major Herman S. Wigodsky, M.C., for making this study possible; to Mr. Harold L. Berridge and members of his physical training staff for their support and assistance in the early development of the test in the Gulf Coast Air Corps Training Center with headquarters at Randolph Field, Texas; to Mr. Jesse B. Miller, Mr. Howard Whitmore, Mr. Richard W. Tews and their instructors for their support and assistance in collecting the data at the Army Air Forces Officer Candidate and Officers Training School at Miami Beach, Florida; to Dr. George T. Stafford and members of his staff for their support and assistance in collecting the data at the Army Service Forces School for Physical Reconditioning Instructors at Camp Grant, Illinois; to Dr. Leonard A. Larson, Mr. Lloyd O. Appleton, and Dr. P. V. Karpovich for providing certain other data pertinent to this study; and to Dr. Earl L. Green for critically reviewing this paper and assisting in certain revisions of the manuscript.

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Development Of Motor Coordination In Boys And Girls

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THE ability of the individual to manage his own body varies markedly from childhood, through adolescence, to maturity. The normal child of school age can perform the motor acts of everyday life, but there are wide individual differences in the precision and facility with which these movements are made. As the child grows and matures, changes in such components of motor coordination as agility, balance, flexibility, strength, and control take place. The Brace Test[2*] provides an instrument for the measurement of these aspects of physical ability and can be used at all school ages.

In the California Adolescent Study,[6] the Brace Test was given at six-month intervals to boys and girls aged 13.0-17.5 years. These subjects attended the Claremont Junior High School and either University or Technical High School in Oakland, 1934-38. Records from fifty girls and from thirty-six boys who were tested consecutively over a 4-year (girls) or 4.5-year (boys) period were available. Because of the small number of subjects and of possible practice effects due to frequent test repetition, these data were not adequate for the investigation of changes in motor coordination in boys and girls.

In order to obtain additional comparable data and also to extend the age range, six hundred and ten children (325 girls and 285 boys) were tested during the years 1943-45. The majority of these were enrolled in the Claremont Junior High School and in the tenth grade of University High School, Oakland, California. The younger subjects were members of the Growth[10] and Guidance[11] Studies, Institute of Child Welfare, who were enrolled in the Berkeley elementary schools or children who attended the Children's Recreation School, University of California. The age range of these subjects is from 10.5 to 15.5 years for boys, 16.0 for girls.

Tests were given at the school during school time. Teachers were most cooperative and the children were well motivated. Subjects were tested in small groups, from six to ten depending upon age. All descriptions and demonstrations were given by the author and all scoring was done by her also. If a subject did not pass on the first trial, a second trial was given. If there was an obvious misunderstanding of instructions, an additional trial was permitted. A

* Numbers refer to references at end of article.

TABLE I

MEAN BRACE TEST SCORES BY CHRONOLOGICAL AGE

		Age in Years																	
		10.8	11.3	11.8	12.3	12.8	13.3	13.8	14.3	14.8	15.3	15.8	16.3	16.8	17.3
C-S Girls	No.	22	22	25	36	36	33	38	36	27	42	30	26		
	Score	10.5	10.5	11.4	12.3	11.3	12.0	11.6	12.5	11.6	11.5	10.6	10.8		
			11.1		11.8		11.8		12.1		11.1				
L Girls	No.					9	32	46	53	53	53	53	44	21	7
	Score					12.0	11.9	11.6	11.6	11.8	12.0	11.9	12.3	12.2	12.0
							11.8		11.8		11.9		12.3		
C-S Boys	No.	23	25	23	25	32	35	41	30	24	20	6			
	Score	11.0	10.5	11.6	13.0	12.6	13.0	13.0	14.2	15.0	14.7	16.0			
			11.1		12.7		13.0		14.5		15.0				
L Boys	No.					7	21	33	36	36	36	36	36	29	15
	Score					12.9	13.1	13.2	14.0	15.0	15.2	15.7	16.0	16.5	15.7
							13.2		14.5		15.4		16.2		

success on any of these trials was scored "pass." Every effort was made to reduce chance errors and to secure a true picture of the ability of the individual to perform.

Mean scores on the Brace Test by half years of age for both groups of subjects are given in Table I. (The present group of subjects will hereafter be referred to as the C-S or "cross-section" group, the California Adolescent Study as the L or "longitudinal" group.) The boys of both groups show practically identical scores at all ages where the data overlap. Results for girls have slightly different trends after the fifteenth year. Curves (Fig. 1) for the L group are smoother, as might be expected, since they represent the same individuals throughout. Fluctuations due to sampling occur in the C-S data as the number of cases in any half year ranges from 25-42.

The curve for boys shows an early rise followed by a period of no gain, then another sharp rise. Rate of gain in test scores is almost certainly affected by the phase of physical development of the boys. Dimock[5] has pointed out a slowing in development in motor ability (as measured by the Brace Test) preceding the period of maximum growth in the male. The average age of maximum growth in height, for boys in the California Adolescent Study, is approximately 14.5 years. Both C-S and L groups in this study show no gain in test scores between 12.5 and 14 years but rapid gains are registered in the fifteenth year. Ratings of physiological maturity (based on several criteria) made on L group boys, indicated that by 12 years practically all boys had entered at least the first phase of the cycle of puberty. Not until 16 had the majority completed all three phases. Correlations of the Brace Test scores with physiological maturity, chronological age held constant, ranged from —.67 at 12.8 years to +.03 at 14.3 years and +.33 at 16.3 years.[7]

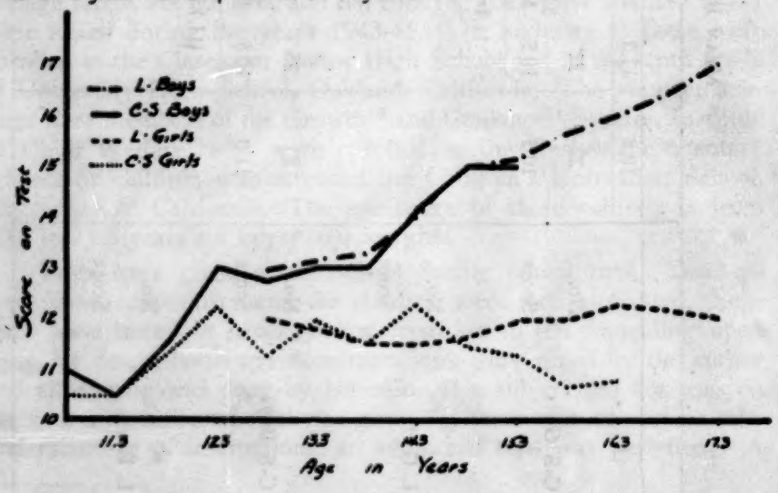

FIGURE 1 Scores of Boys and Girls on the Brace Test Battery

Evidently boys in the first stages of pubescence do not perform well in the Brace Test. The period of no gain found in this study, corresponds to the early pubescent phase in most boys.**

The performance of girls on the test battery improves up to the twelfth year, then levels off. The L group maintains this level, but the C-S girls over 15 show some loss. Failure of girls over 15 to improve has been noted by a number of investigators.[4, 6, 13, 15] Indeed, an actual loss is usually found in activities involving running and jumping.

Sex differences in scores on the battery become evident by the thirteenth year and increase markedly after 14.

The twenty stunts of the Brace Test were selected to include a wide variety of coordinations not frequently practiced. An attempt has been made to classify these stunts on the basis of characteristic type of muscular demands.[14, p. 166] The first class requires maximal or nearly maximal concentric or "shortening" muscular contraction over a minimum of time. All of the events in this class depend in part upon power (strength x velocity) of legs. This class will be called "agility," defined as the "ability to change the direction of the body or its parts in space very rapidly."[12, p. 84] The second class is made up of stunts which require eccentric or "lengthening" muscle contractions. Four of these are largely dependent upon leg strength, and one on a combination of arm and leg strength. This class will be called "control."

It may be pointed out that tests in both of these groups depend to some extent upon strength but the deciding factor in performance is coordination, including the effective use of strength. Some of the tests in each group depend upon flexibility, or free action over the full range of joint movement. Almost all require a high degree of dynamic balance: in class I, where a rapid body movement is arrested abruptly and the final position held; and in class II, where the body balance must be maintained throughout movement involving both the supporting leg or legs and other parts of the body.

The third class contains two events which have been called measures of "strength." The one is characterized by concentric muscle action in which speed is not a factor. The other involves both concentric and eccentric contraction.

The remaining tests form a much less homogenous group than the preceding three. All of this fourth class require a static type of muscular contraction. In two of the tests, the positions to be held are difficult; indeed, one of them is a balance on the hands. In both

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** It is possible that this "adolescent lag" just noted in test scores is exaggerated by the structure of the test itself. By the twelfth year, four of the twenty stunts are passed by all boys, five more are passed by approximately 95 percent. Thus, limitations of the test battery may operate to reduce the possible rate of gain.

CLASSIFICATION OF BRACE TESTS

Class I, Agility

6. Change from squat sitting to stride standing with arms sideways, three times in succession. (Rhythm)
7. Jump into the air, make a full turn left, hold position at finish. (Balance)
15. Same as 7 except turn right.
16. Jump to feet from kneeling position, hold balance. (Balance)
8. Clap feet together twice in air.
10. Jump foot through loop made by grasping other foot in opposite hand. (Flexibility)

Class II, Control

4. Kneel onto both knees, stand again.
13. Stand on one foot, bend forward, place hands on floor, touch head, recover. (Balance)
9. Stand on R foot, grasp L foot behind right knee in R hand, bend and touch L knee to floor and stand again. (Leg strength, balance)
20. Sit down on heel of L foot with R foot extended forward off the floor, stand again. (Leg strength, balance, flexibility)
17. Sit, then stand again, with arms folded and feet crossed. (Leg strength, balance, flexibility)

Class III, Strength

3. Sit up from supine lying without raising feet from floor. (Abdominal strength)
5. Push up from front leaning rest position 3 times. (Arm and shoulder girdle strength)

Class IV, Static Balance

14. Balance 5 sec. in a squat position with arms between knees, behind ankles, and fingers touching in front of ankles. (Flexibility)
19. Balance 5 sec. on hands, knees over elbows. (Arm and shoulder girdle strength, flexibility)
18. Balance 10 sec. on left foot while keeping right foot against inside of left knee, hands on hips. Eyes shut.

of these, flexibility, and in the second, arm and shoulder girdle strength are quite probably more important than balance. The third test requires balance on one foot with the eyes shut. This class is referred to as "static balance."

The percentage passing each stunt at each half year of age has been used to analyze trends in the development of the various classes of coordination.*** An examination of the data for boys (Tables II and III) shows that over 90 percent at 11.5 years can pass tests 3, 4, 14. All boys of 15 can pass three other tests: 6, 5, 13, but there is steady improvement from approximately 70 percent passing at 11 to 100 percent at 15 years. The remaining ten tests are more difficult but are performed satisfactorily by a greater percentage of boys at each successive age level.

Curves for tests classed together above were compared and the most closely related ones were combined (Fig. 2). All of the "agility"

*** Tests 1, 2, 11, 12 were passed by 100 percent of both boys and girls in the study and so are not included in the discussion.

TABLE II
PERCENTAGES OF C-S BOYS PASSING BRACE TESTS

Test No.	*Chronological Age*									
	10.8	11.3	11.8	12.3	12.8	13.3	13.8	14.3	14.8	15.3
3	83	100	91	92	100	100	98	97	96	95
4	87	96	96	100	97	94	95	93	100	95
5	74	64	70	72	97	94	98	100	100	100
6	70	76	91	100	91	97	98	100	100	100
7	17	8	4	20	28	23	12	27	46	45
8	17	0	17	12	22	26	37	43	50	40
9	17	4	13	36	19	14	24	37	25	35
10	0	0	0	8	9	8	17	40	46	35
13	70	84	96	96	97	100	100	97	100	100
14	91	84	96	96	91	94	93	100	100	90
15	9	0	17	16	25	23	15	40	38	40
16	52	44	56	72	62	66	56	60	79	90
17	61	44	48	56	50	51	44	43	67	45
18	52	28	48	64	47	60	68	70	71	55
19	30	28	26	32	22	34	34	57	50	65
20	0	4	0	20	6	17	15	20	29	40
No. of Cases	23	25	23	25	32	35	41	30	24	20

TABLE III
PERCENTAGES OF L BOYS PASSING BRACE TESTS

Test No.	*Chronological Age*									
	12.8	13.3	13.8	14.3	14.8	15.3	15.8	16.3	16.8	17.3
5	71	90	88	95	100	100	100	100	100	100
6	71	90	91	97	94	92	100	100	100	100
7	14	24	24	36	44	55	61	58	59	57
8	43	33	42	44	50	67	75	75	79	87
9	14	24	27	30	30	33	44	53	65	67
10	0	14	15	17	19	25	30	36	52	53
14	100	100	100	100	100	100	100	100	100	100
15	14	14	21	22	47	43	47	50	52	53
16	57	71	73	80	86	92	92	94	96	93
17	28	48	36	44	47	44	53	53	65	33
18	57	38	55	69	72	86	78	78	69	63
19	43	57	54	53	67	69	75	69	66	73
20	0	24	27	30	33	33	36	30	39	33
No. of Cases	7	21	33	36	36	36	36	36	29	15

measures show similar rates of gain after the thirteenth year, but the one group, 8-10, does not show the failure to gain in the thirteenth year which characterizes the others of this class and which has been associated with the onset of puberty.

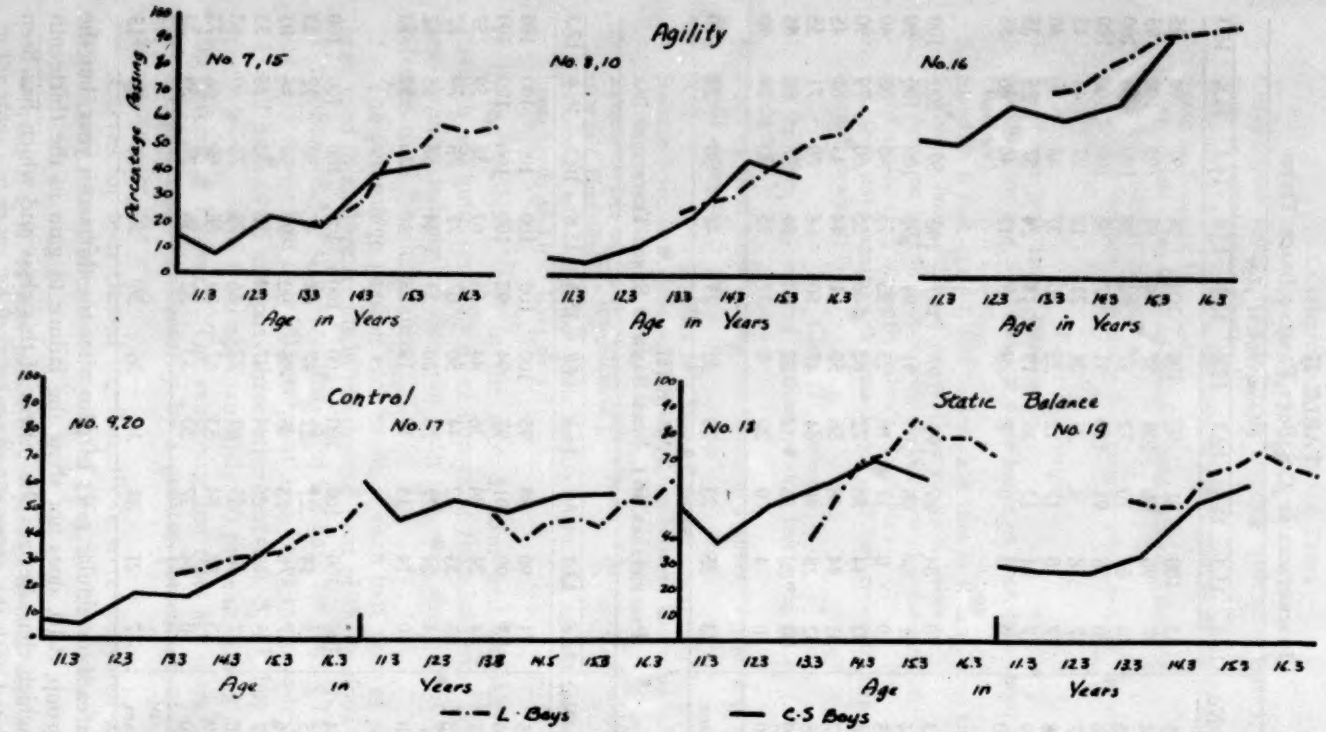

FIGURE 2 Percentages of Boys Passing Certain Tests

The "control" tests show this same "adolescent lag." The analysis of tests reveals that all which show this characteristic have the factor of dynamic balance in common.

No data on changes in dynamic balance in puberty have been reported in the literature. There is no suggestion of a similar trend for girls in this study. (Average age of maximum growth in height of girls in the California Adolescent Study falls between 12.0 and 12.5 years, so any similar effect in girls should be observed within the limits of this study.) Changes in center-of-gravity are greater in males than in females.[17] It may be that the more intense growth of boys, and especially the very large annual increments of early-maturing boys[18, p. 37] bring about such rapid changes in physique and bodily proportions that the boy is unable to adjust readily in unaccustomed situations. Further investigation is needed in this area.

Test 17 was classed with 9 and 20 as "control." In this event, the C-S group especially shows little change with age. It is unfortunate that other tests of this class, 4 and 13, are passed by too great a percentage of the subjects to provide data for study. On the basis

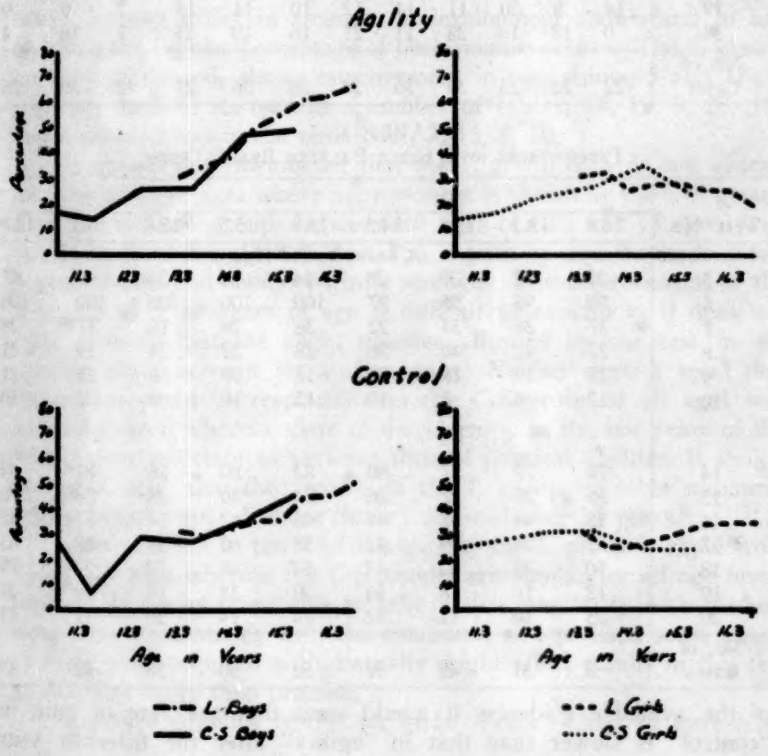

FIGURE 3 Composite Curves of "Agility" and of "Control"

TABLE IV
PERCENTAGES OF C-S GIRLS PASSING BRACE TEST

Test No.	*Chronological Age*											
	10.8	11.3	11.8	12.3	12.8	13.3	13.8	14.3	14.8	15.3	15.8	16.3
3	91	77	88	97	100	91	84	94	89	93	87	88
4	91	86	92	97	83	94	95	97	81	98	93	88
5	45	36	36	47	39	48	39	28	33	21	13	15
6	68	91	92	97	89	97	95	97	100	100	97	96
7	9	4	12	19	14	21	21	53	37	24	17	19
8	18	18	24	22	17	36	39	50	22	26	20	38
9	18	4	24	28	17	33	18	14	18	17	17	15
10	0	0	0	6	3	0	3	14	15	0	3	4
13	77	82	88	92	97	88	84	94	85	83	87	96
14	86	77	72	89	78	79	82	78	74	69	60	61
15	4	4	32	39	33	33	29	36	33	33	23	15
16	45	36	40	56	39	36	50	56	48	57	30	42
17	50	45	60	64	47	48	55	44	37	52	50	46
18	41	68	56	53	64	64	53	64	59	64	63	46
19	14	9	20	11	14	12	10	14	15	2	0	0
20	0	18	16	25	11	21	16	19	15	7	10	4
No. of Cases	22	22	25	36	36	33	38	36	27	42	30	26

TABLE V
PERCENTAGES OF L GIRLS PASSING BRACE TESTS

Test No.	12.8	13.3	13.8	14.3	14.8	15.3	15.8	16.3	16.8
	Chronological Age								
5	25	22	20	26	34	32	36	47	47
6	90	93	96	97	100	100	100	100	100
7	37	26	33	22	30	26	16	17	26
8	37	42	40	26	28	32	24	19	21
9	25	19	18	20	16	20	30	21	21
10	12	6	7	10	12	10	6	2	10
14	78	77	67	80	82	80	76	81	84
15	56	39	27	26	24	30	28	26	26
16	25	45	47	44	46	42	54	55	42
17	62	64	49	42	58	60	58	67	63
18	50	48	42	42	54	68	72	74	79
19	12	16	18	16	20	18	16	19	21
20	25	10	11	12	14	14	16	17	21
No. of Cases	8	31	45	50	50	50	50	42	19

of the available evidence, it would seem that the rate of gain in "control" is slower than that in "agility" after the fifteenth year (Fig. 3).

Tests 18 and 19 from the class "static balance" are not suffi-

ciently similar to permit combination. There is a suggestion in the curves for both events that growth stops after 16, but the evidence is not conclusive (Fig. 2).

The marked improvement of the adolescent boy in all events cannot be attributed to specific practice since both the C-S and L groups show similar levels of performance and rates of change. It reflects, rather, an increased capacity to perform resulting from growth and development in strength and neuromuscular control.

Results for the two groups of girls are less consistent than those for boys, as indicated in Tables IV and V. Tests 3, 4 and 6 are passed by practically all 11-year-olds but it should be noted that 3 is never passed by all girls. Body build is probably the deciding factor here as any of these children has strength enough to sit up once if the feet are held in place. Short legs and heavy hips, which are characteristic of some adolescent girls, make performance of this test extremely difficult if not impossible.

In all other tests, the typical curve for the C-S girls is one which shows improvement at the younger age levels and decline at the older ones. Results differ in amount of development shown and in age at which the highest percentage of performance occurs. The L group, on the other hand, shows improvement in two stunts, 5 and 18; a tendency to hold its own in a number of others, 14, 19, 9, 20, 16; and a decided loss in the remainder, 7, 15, 8, 10.

It should be remembered that the L group data do not extend into the younger ages where improvement is shown by the C-S group. Data for the two groups between the ages of 12.5 and 15 agree well except in tests 5 and 18.* Test 5 is a push-up and demands a fair degree of arm-and-shoulder-girdle strength. The improvement of the L group after 15 years of age is difficult to explain as it does not seem possible that the slight practice afforded by one test in six months could account for such a gain. Neither does it seem that motivation could be responsible as the C-S group at all ages was well motivated whereas some of the L group in the last years of the Study were reluctant to perform tests of physical abilities. It should be noted, also, that the records of the L group on other measures (dash, broad jump, distance throw) declined after 15 years.[6]

Improvement in test 18 (balance) by the L group is rapid from 14 to 17 years whereas the C-S results are similar for all age levels studied. It seems reasonable to believe that familiarity with the test situation, acquaintance with the examiner, and perhaps some assurance or poise acquired with maturity might affect results in this test as much or more than practice.

Figure 4 presents results for girls. Tests 14 and 19 were com-

* The L group was found to be significantly superior in these same events to a matched group of eleventh grade girls. 6, p. 29

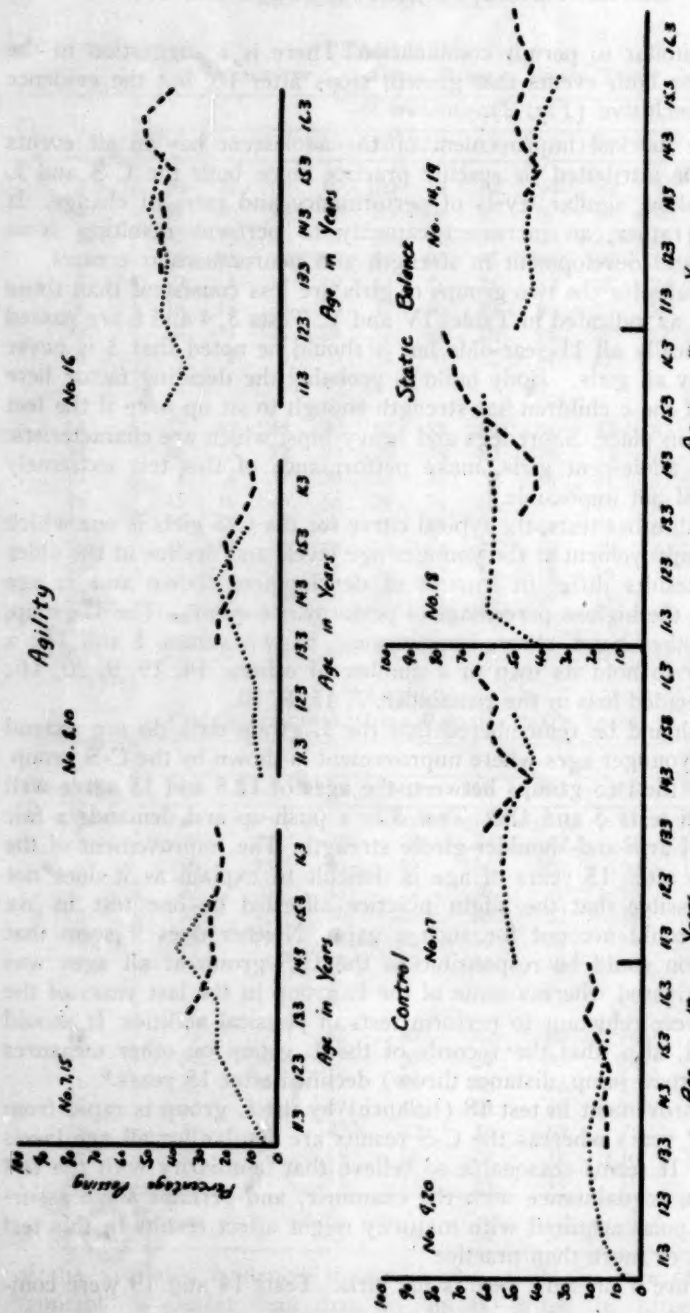

FIGURE 4 Percentages of Girls Passing Certain Tests

bined but 18 showed a different pattern of change. This pair is called "flexibility and balance" to call attention to the added common

factor. Practically no change occurs in this class over the entire age range studied.

When all "control" and all "agility" tests are combined (Fig. 3), it may be observed that there is a gain in "agility" from 10.5 to 14.5 years of age and then after 15 a loss, until at 17 the percentage passing is about equal to that at 11. A different pattern is presented by "control" tests. In these the changes throughout scarcely exceed 10 percent. After the thirteenth year the C-S group declines slightly. The L group, however, shows a slight steady gain so that the percentage passing at 17 is greater than that at 12.

It was mentioned above that the L group showed a tendency to hold its own in certain tests. The two "balance and flexibility" and the three "control" tests all show this. The tests in which both groups decline belong to the "agility" class.

A number of authors have explained the loss in ability of adolescent girls in events requiring speed or leg drive on the basis of heavy hips and thighs,[15] longer trunk and less muscular legs,[14] or broader pelvis and obliquity of the femur.[20] In an experimental study on college women, Carpenter[3] found no significant relationship between athletic performance and "femininity" of build. Nogues[16] investigated the relationship of a number of physical measurements and body proportions of high school girls to performance in running and jumping and found negligible relationships for all except subcutaneous tissue. Excess fat correlates negatively with performance. Travis,[19] on the other hand, reports high positive correlations between weight and dynamic balance as measured on a stabilometer. If high school girls are given regular training in jumping and throwing, no decline in ability occurs.[1] It would seem doubtful, then, that the loss in "agility" measures can be attributed to the physical changes of adolescence.

Other factors which might affect performance, such as health, skill, and interest, were studied by Nogues, also. No single factor was significantly related, but the small group of girls who continued to improve in running and jumping between 13 and 16 years of age was slightly above the group average in all of these factors.

It seems possible that the girls of both the L and C-S groups found the maximal effort involved in the "agility" class stunts less interesting, in fact, decidedly objectionable, whereas the "control" exercises required a milder degree of exertion. The fact that the L group of girls had been introduced to these latter stunts at an earlier age may have given them a favorable orientation that the older C-S group lacked, thus accounting for the better performance of the former group.

The most striking sex difference at all ages is in test 5 (push-up). Here the boys are superior throughout. It is interesting to note

that a similar striking sex difference exists in another type of performance which depends also upon arm and shoulder girdle coordination, the distance throw.[6]

The greatest similarity is in test 17. Approximately equal percentages of boys and of girls pass this test at all ages. It appears to be slightly easier for older than for younger children but little change occurs in the age range included in this study. This test is especially difficult for tall long-legged individuals and also for overweight ones. Perhaps a number of failures at younger ages are caused by lack of sufficient strength while those at later ages are due to body size or proportion.

The percentage passing "agility" and "control" tests for both sexes is approximately equal from 10.5 to 13 years. At 14, boys are superior and this superiority increases thereafter. The type of muscle action required in the "agility" events is similar to that demanded in active games and sports, but the fact that it is combined with other elements, especially dynamic balance, makes this group of stunts relate closely to such activities as tumbling and modern dance. Coordinations, such as those listed under "control" occur most frequently in these latter activities, also, although many acts of everyday life are done more gracefully when a high degree of "control" is exercised, for example, sitting and standing, climbing and descending stairs. A recognition of the differential capacity of the sexes may be observed readily at a performance of acrobats or of the ballet. Feats of maximum agility are performed by men while women specialize in acts of flexibility and control.

SUMMARY

1. The increment pattern for boys of total scores on the Brace Test battery is similar to that of adolescent growth in standing height. Scores for girls show little change after the thirteenth year.

2. The stunts of the Brace Test battery were placed in four general classes according to the predominant type of muscular action demanded. Additional elements necessary for performance were noted. "Dynamic balance," especially, is important in many events.

3. Boys show an increase in ability to perform events of all classes. The rate of growth is greater after 14 years of age than before and appears to be more rapid in "agility" than in "control."

4. All tests for boys in which "dynamic balance" is a factor show a marked "adolescent lag." A possible explanation may be made in terms of rapid changes in body proportions and center of gravity.

5. Girls improve in "agility" up to 14 years, then decline. In "control" and in "flexibility and balance," little change can be seen over the age range studied. Loss in "agility" measures is attributed to changes in interest rather than to lack of capacity.

6. Practice afforded by one test in six months may have been a factor in preventing any decline of girls in "control" and in "flexibility balance" measures. There were no noticeable practice effects for boys.

7. There are only slight sex differences in total scores or in measures of the various classes before the age of 13.8 years. After this time, boys excel in all events and their superiority increases rapidly at each successive age level. Differences are most marked in "agility."

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Use Of The Billig Exercise For Dysmenorrhea For College Women

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INTRODUCTION

DYSMENORRHEA or painful menstruation has been of vital concern to gynecologists for a long period of time. In the last few years both the industrial and educational programs have exerted pressure in the field of research for the solution of this problem in order to decrease absenteeism and increase efficiency.

As a result of research work of numerous investigators various theories have been proposed concerning the etiology and treatment of dysmenorrhea. Factors said to have some effect on painful menstruation are the psychic and emotional status, weak abdominal muscles, structural faults, malfunctioning of the ovarian hormone, and postural defects. Billig[4]* has focused much attention on the two latter factors. He states that there is present in individuals possessing dysmenorrhea contracted ligamentous bands in the abdomen, which cause compression of the nerve pathways and thereby produce irritation of the peripheral nerves. Billig[2] also indicates the relationship of the ovarian hormone level to fascial contraction.

The treatment advocated by Billig consists of a ligamentous stretching exercise[3] carried out in a prescribed manner. According to available literature relative to this method of treatment, all indicate high curative value. In most instances reports show that approximately 80 percent of the individuals afflicted with this difficulty were either relieved or cured with the Billig exercise.[3, 6, 8, 9] There is in the literature, however, no evidence as to the detailed procedure followed or the scientific and statistical basis on which these reports were founded. Other exercises, such as the Mosher exercise, the knee-chest position, etc., have been suggested by investigators concerned with the solution of the problem.[1, 5, 7, 10] Studies again reveal noticable degrees of relief and cure attributed to the performance of these specific exercises.

PURPOSE

The purpose of this study is two-fold:

1. To investigate the accompanying symptoms of dysmenorrhea.
2. To analyze the results in two experimental groups, one of which

* Superior figures refer to numbered bibliography at end of article.

performed the Billig exercise and the other, a series of five exercises prescribed by the writer.

PROCEDURE

Data for this study were collected at the State University of Iowa during the second semester of 1945-1946 from 101 volunteer women who had varying degrees of dysmenorrhea. Of this group fifty-three did the Billig exercise and forty-eight did a series of five exercises. The former was done three times daily while the latter was done once a day. The total daily time for each group was approximately the same. The exercises in the series were selected with the intention of alleviating dysmenorrhea by stretching abdominal ligaments and relieving abdominal congestion. This series consisted of the Mosher exercise,[10] an exercise in hook-lying position in which the knees are touched to the floor at the sides alternately, a diagonal stretching exercise while lying on the back, a crouched position on all fours with alternate leg extension, and the knee-chest position.

Interested individuals were contacted personally by the writer during an introductory and discussion period relative to the problem. If a subject was under medical care, her physician's approval for her participation in the study was secured. The exercises were taught to the subjects in small groups by the writer. Complete details regarding the performance of the exercises and an explanation of submitting data sheets were given. All cases were checked the following week and again at the middle of the semester for the manner in which they did the exercises. The subjects were furnished with two types of data sheets at the beginning of the study; one indicated the frequency of performance of the exercises and was to be turned in every two weeks, and the other was a menstrual data sheet to be turned in immediately after each menstrual period. This latter sheet consisted of information relative to (1) symptoms accompanying dysmenorrhea, such as headache, general body weakness, vomiting, irritability, etc., (2) the length, nature, location, and day of pain; (3) the extent of modification in physical education classes; (4) the use of drugs and heat; (5) continuation of bathing during the period; (6) types of activity participated in during the menstrual period. A cumulative record card was made for each individual, thereby presenting a clear, concise picture of her entire data. As the study progressed it became apparent that some cases failed to do the exercises daily. Consequently the two experimental groups were subdivided into those who did the exercises ten to fourteen days of every two-week interval, and those who did them less than ten days in that same length of time. They were referred to as Group A and Group B respectively. Once placed in Group B, cases remained in

that subdivision for the remainder of the study.

Near the end of the semester a final questionnaire was filled out by each subject, the purpose of which was to secure opinions on different aspects of the experiment and to obtain information which was not secured previously. After a period of four months it was possible to give a second questionnaire as follow-up on 50 percent of the cases who were "cured" or relieved.

ANALYSIS OF DATA

In interpreting the results of this study the reader must be aware of the fact that it is based in its entirety on the personal reports as turned in by each individual for fifteen weeks. Slight discrepancies may be expected concerning refined numerical data from the subjects and questions requiring subjective judgment.

Symptoms.—Table I is so set up that a representative picture may be secured for Groups A and B in the Billig and series sections during each menstrual period. Variations in the number of cases in each group appear in each table. The small number of cases makes it impossible to attribute significant value to the results of Group B or to the data secured during the fifth menstrual period.

The symptoms accompanying dysmenorrhea included the following: headache, depressed feeling, irritability, general body weakness, irritated eyes, nausea or vomiting, and chills or hot flashes. Two cases indicated the presence of painful breasts a few days before and during the menstrual period. General body weakness, irritability, and a depressed feeling were the most common symptoms in both the Billig and series groups at the beginning of the study. At the end of the fourth menstrual period these same symptoms were most prevalent in the A group of the Billig division. In the series A group headaches replaced irritability as one of the most common symptoms, with general body weakness and depressed feeling remaining as the other two. Table I presents a more complete analysis of the symptoms accompanying dysmenorrhea for each experimental group.

A more comprehensive approach was taken in that consideration was given to those cases who possessed four of the symptoms at the beginning of the study and had none during the fourth menstrual period, and to those who had five or more of the seven symptoms at the beginning, and showed the existence of only two or fewer at the close of the study. These two categories were combined and gave the following results: in the A groups of the Billig and the series divisions, ten out of thirty-seven and three out of thirty-two respectively were in this classification; in the B groups of fifteen and eighteen cases, three individuals in each group were in this category.

TABLE I

SYMPTOMS ACCOMPANYING MENSTRUAL PERIOD

			Menstrual Period									
	1st		2nd		3rd		4th		5th	
	Billig Series		*Billig Series*		*Billig Series*		*Billig Series*		*Billig Series*	
N=	53*	48*	(A)**	48	37	42	43	37	32	15	15
			(B)***	5	11	9	14	14	15	6	8
	%		%			%		%		%	
Headache	45*	31*	(A)	33	32	24	26	16	28	13	20
			(B)	40	36	67	64	37	40	33	38
Depressed Feeling	68*	65*	(A)	58	54	43	41	30	31	27	33
			(B)	40	45	67	57	43	27	33	38
Irritability	72*	71*	(A)	46	51	38	32	20	25	13	20
			(B)	0	36	22	36	43	53	50	38
General Body Weakness	76*	81*	(A)	52	49	45	50	43	34	33	40
			(B)	20	36	67	50	57	40	33	38
Irritated Eyes	13*	6*	(A)	17	14	12	12	14	9	0	7
			(B)	0	18	0	14	7	0	0	13
Nausea or Vomiting	34*	25*	(A)	8	14	17	8	14	9	7	7
			(B)	40	36	11	14	7	20	17	25
Chills or Hot Flashes	43*	44*	(A)	29	16	19	21	24	22	0	7
			(B)	40	55	11	43	14	27	33	0

* Groups A and B combined.

** A: Did exercises ten to fourteen days in every two-week interval.

*** B: Placed in this group as soon as exercises were done less than ten days during an interval.

This seems to indicate slightly better results from the Billig exercise.

Analysis of Pain.—The location of menstrual pain was indicated as existing in the upper or lower back, pelvis, legs, groin, and the abdomen. During the first menstrual period of the study pain existed in the Billig group in 98 percent of the cases, with 79 percent of them having abdominal pain and 60 percent indicating backaches. During the fourth period 57 percent of the Billig A group evidenced pain, in which instance 41 percent still had pain in the abdomen and 30 percent had backaches. The incidence of pain in the pelvis, legs, and groin showed decreases during the fifteen weeks.

In the series group 100 percent experienced pain during the initial menstrual period. Of this group 84 percent of the cases had pain in the abdomen, 65 percent in the back, and 50 percent in the groin. During the fourth period 73 percent of the A group still indicated pain in one of the five previously mentioned locations. Of this group 55 percent had abdominal pain and 33 percent experienced backaches. The greatest decrease was in the incidence of pain in the

groin. The decrease in the frequency of pain in the legs was from 27 percent to 15 percent. Little change resulted in reference to pelvic pain. It is interesting to note that thirteen of the fourteen cases in the Billig B group had pain during the fourth menstrual period in comparison with the ten of the fifteen cases of the series B group.

Table II presents a more concise picture of the number of cases cured or relieved of menstrual pain through exercise. For purposes of this study the writer considered a subject as "cured" if she indicated no pain in her last two menstrual periods. If she indicated diminishing severity of pain in her last two or three periods, she was considered relieved. The results of decrease of the frequency of cases possessing pain are favorable for both experimental groups. Irregular performance of the exercises appears to show better results in the series group. The true curative value of the exercises could be determined only by a long-term follow-up on the cases.

TABLE II

RESULTS OF EXERCISE FOR DYSMENORRHEA

Billig Group			*Series Group*		
	% Relieved	*% Cured**		*% Relieved*	*% Cured**
(38)**	40%	34%	(30)**	53%	20%
(15)***	27%	7%	(18)***	33%	11%

* Read discussion for definition of "cured."

** Group who remained in Group A throughout the entire study.

*** Group of cases who were placed in Group B sometime during the study.

Slight discrepancies may exist regarding the number of hours of pain during each menstrual period as reported by the subjects. In the Billig group 23 percent had pain four hours or less during the first menstrual period and 22 percent of the A group were in this category during the fourth period. A possible explanation of no noticeable decrease is that the majority of cases who were in this group at the beginning were "cured," and some of those who had pain five to eight hours moved into this classification. In general, the subjects who had thirty-six to forty-eight hours of pain indicated a reduced number of hours.

For the series group a different interpretation is necessary. During the first period of that group 35 percent had pain four hours or less with an increase of 5 percent in the A group during the fourth period. This point can be explained by stating that fewer cases were "cured" and that more of the cases, who had long periods of pain previously, were placed in the four-or-less or five-to-eight-hour category. As in the Billig group, the subjects who had pain over a day or more received noticeable relief.

Table III shows the variation throughout the study in percentage of cases relative to the severity of pain. Pure subjective

judgment is the basis of this table. Doubtless, there is more consistency in the subjects' judgment from one menstrual period to the next than there is between subjects. It is the comparison between successive menstrual periods for the same individual that is important. It is difficult to say that the severe cases of the first menstrual period in both the Billig and series groups were all severe. Table III shows the decrease of severe, moderate, and varied cases during the study. As a result the number of mild cases approximately doubled for both the Billig and series groups from the first to the fourth menstrual period.

TABLE III

DEGREE OF PAIN

	Menstrual Period									
	1st		2nd		3rd		4th		5th	
	Billig	*Series*	*Billig*	*Series*	*Billig*	*Series*	*Billig*	*Series*	*Billig*	*Series*
N=	53*	48*	(A)** 48	37	42	43	37	32	15	15
			(B)*** 5	11	9	14	14	15	6	8
	%		%		%		%		%	
Severe	38*	33*	(A) 21	19	21	23	11	13	7	20
			(B) 60	27	56	29	50	0	17	13
Moderate	23*	17*	(A) 17	16	10	6	5	3	0	7
			(B) 0	0	0	7	0	0	0	13
Mild, just noticeable	25*	25*	(A) 40	43	4	53	41	56	27	27
			(B) 40	18	22	36	31	53	50	38
Varied, mild to severe	13*	22*	(A) 8	8	5	9	0	0	0	7
			(B) 0	18	0	14	7	20	17	13

* Groups A and B combined.

** A: Did exercises ten to fourteen days in every two-week interval.

*** B: Placed in this group as soon as exercises were done less than ten days during an interval.

Pain was of such severity during the first menstrual period in 49 percent of the Billig group and 42 percent of the series group that the subjects went to bed. During the fourth menstrual period these figures decreased to 19 percent and 9 percent for the A divisions of the respective groups.

Pain occurred in the majority of the cases during the first day of the menstrual period. A noticeable number indicated pain during the first two days of the period or during the day before and first day of the period. The range of the day of pain was from a week before to the third day of the menstrual period.

Aids to Relief.—The use of heat and drugs to relieve pain was very prevalent. Of the two aids, drugs were more commonly used. The drugs used by the individuals were aspirin, midol, kurbs, codeine,

thyroid, and others prescribed by a physician. Methods of heat included the hot water bottle, hot pad, and hot drinks. By the end of the study a decrease occurred in both the Billig and series groups in the use of these aids to relief.

Length of Menstrual Period.—The range of the length of the first menstrual period for both the Billig and the series groups was three to eight days. At the end of the study the range was four to seven days. The number of cases having a period of four to six days increased from thirty-eight to forty-six cases in the Billig and thirty-eight to forty-one cases in the series group.

Regularity of Performance.—When considering the number of cases who did the exercises consistently without missing a day, the Billig group exceeded the series group during every two-week interval. In general the percent missing one or two days during the intervals was higher for the series group than for the Billig group. The majority of the cases of the Billig B group missed only five days, while the series B group varied a great deal from five to fourteen days.

Final Questionnaire.—Results from the final questionnaire showed that 42 percent of the Billig group and 67 percent of the series group stated dysmenorrhea to be a problem in the family. The tendency to be less active during the menstrual period was reflected by more than half of the cases. The following reasons were given: body weakness, illness, severe cramps, fear of strain, discomfort, backaches, and heavier flow. Of each experimental group 23 percent thought active exercise was desirable in which cases dancing, hiking, and bowling were engaged in most frequently. Previous to this study only eleven subjects had used exercise in an attempt to relieve dysmenorrhea; seven had acquired relief. Two of the eleven cases had used the Billig exercise, one of whom received some relief. Twelve individuals of the Billig group and eight individuals of the series group had had pelvic examinations before this study was carried on. Of the eight cases reporting structural faults, seven secured no relief. The degree of severity of dysmenorrhea in the remaining one case decreased from severe to mild.

Performance of the exercises on weekends and on the first day of the menstrual period was a greater problem to the series group than to the Billig group. Both groups submitted worthwhile suggestions in respect to convenient methods of remembering to do the exercises. The necessity for formation of habit at a regular time was the consensus.

Follow-up Work.—The follow-up work done early in October indicated that in the series group pain returned in mild degree to four of the six cases who were said to be "cured." Two of these

four cases continued with exercise very irregularly. Of the ten relieved cases five, none of whom continued with the exercises, showed increased severity and number of hours of pain. In the Billig group six of the nine "cured" subjects indicated a return of pain in mild degree; none of them had continued with exercise. Of the eight relieved cases seven showed increased severity of pain; two had continued with exercise irregularly.

In general, the number of symptoms accompanying dysmenorrhea increased after discontinuing exercise. More cases have resorted to the use of drugs and heat for relief than at the close of the semester. During the follow-up period more individuals went to bed during the menstrual period than at the end of the experiment. No individuals in the B groups of either the series or Billig divisions remained "cured" or relieved. Several individuals related returned dysmenorrhea to climatic changes.

SUMMARY AND CONCLUSIONS

At the end of the fifteen weeks in which the exercises were performed the following observations were made:

1. Exercise had a favorable effect in decreasing the occurrence of undesirable symptoms accompanying dysmenorrhea; the effect was more noticeable on the Billig group than on the series group.
2. Little difference occurred between the Billig and series A groups in relation to the number of cases relieved or "cured."
3. The duration of the menstrual period for the majority of individuals was four to six days; with the use of exercise the extreme cases tended to approach this range.
4. Of the subjects who were less regular in performing the exercises, the number relieved in the series group exceeded that in the Billig group.
5. The number of cases with a severe degree of dysmenorrhea was decidedly reduced.
6. The number of individuals who usually went to bed markedly decreased; this was more evident in the series group than in the Billig group.
7. As a result of exercise the use of drugs and heat was lessened noticeably, while bathing habits remained unaffected.
8. Of the total number of subjects, 61 percent desired modified activity during the menstrual period.
9. At the beginning of the study the use of exercise as a means of relief for dysmenorrhea was unfamiliar to the majority of the individuals.
10. Relative to the few individuals who had had pelvic examinations previous to the study and were known to have structural defects, exercise had no effect.
11. The moderate and severe cases exhibited greater interest in

the study than did the mild cases.

As a result of the evidence obtained in the follow-up work the following statements are presented:

1. Relief or "cure" of menstrual pain was maintained for the majority of the cases only while performing the exercises.

2. In the majority of the cases failure to continue with exercise increased the number of accompanying symptoms of dysmenorrhea, induced more cases to use heat and drugs, and caused more cases to go to bed during the menstrual period than were indicated at the end of the experiment.

As a result of the above evidence it can be concluded for this group of 101 college women that:

1. The regular performance of exercises for 15 weeks gives the individual more or less relief from dysmenorrhea on concurrent menstrual periods.

2. The Billig exercise appears slightly more effective than the series of exercises, both in respect to numbers relieved and the completeness of relief.

3. Discontinuance of the exercises for only 15 weeks results in relapse to dysmenorrhea similar to that previously experienced.

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An Analysis Of The Prewar Certification Requirements For Teachers Of Health And Physical Education In The Forty-Eight States

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EDUCATION in the United States has long been a function of the state, and it is necessary, and rightly so, that the state uphold certain minimum standards in order for an individual to be certified to teach. Not only are minimum standards essential for entrance into the teaching profession, but the matter of in-service education of teachers must be a concern of the state.

The earliest teachers of physical education received but a few months of training and this, of but a very technical type, related solely to physical training. Gradually as various state laws began to demand the inclusion of physical education in the schools, the length of the curricula for preparation of prospective teachers of health and physical education increased to two, three, four, and in a few cases five years. The mere increase in length, however, was only one aspect of the realization that more training was necessary. The general trend was to broaden the type of education offered, so that it included, besides a technical knowledge in the field of physical education, more training in the general academic field, a more sound knowledge of the sciences which are the foundation of health and physical education and more stress upon professional education courses.

Considering the state as the focal point of teacher preparation in the United States, what standards, or minimum requirements as to units in each of the above four fields, are demanded? What are some of the specific courses in each of these fields enumerated by the various states?

In attempting to answer these questions, a questionnaire was sent to each of the forty-eight states, asking for information concerning the requirements in the four specific areas mentioned above, which are deemed essential for the adequate preparation of teachers of physical education.

REQUIREMENTS IN THE GENERAL ACADEMIC AREA

In the general academic work it was found that the various states with few exceptions had no specific requirement other than that of a

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This is an abstract of one chapter of the dissertation, "Evaluative Criteria in Physical Education," presented to the Graduate School of Yale University, December 1945, in partial fulfillment of the requirements for the Ph.D.

bachelor's degree, with a major in physical education, from an approved institution. Forty-three of the forty-eight states, as shown in Table I expect the individual to hold the bachelor's degree before certification can take place. Oklahoma, one of the five states not requiring a degree for temporary certification, will grant a teaching certificate for one year upon the completion of ninety semester hours. In order to get a life certificate, however, a bachelor's degree is required. Colorado demands only ninety quarter hours, (60 semester hours), Georgia, 90 semester hours, Idaho, 64 semester hours, and Texas, 60 semester hours. New York is advocating at least five years of preparation, or a year beyond that normally required for the bachelor's degree, in order for an individual to teach in the secondary school.[1]

The State of Washington requires an individual to have com-

TABLE I

DEGREE REQUIREMENTS OF THE 48 STATES FOR CERTIFICATION TO TEACH HEALTH AND PHYSICAL EDUCATION IN SECONDARY SCHOOLS

State		*State*	
*Alabama	Bachelor's Degree	Nebraska	Bachelor's Degree
Arizona	" "	Nevada	" "
Arkansas	" "	New Hampshire	" "
California	" "	*New Jersey	" "
Colorado	(90 quarter hours or 60 semester hours)	New Mexico	" "
		New York	" "
Connecticut	Bachelor's Degree	North Carolina	" "
Delaware	" "	North Dakota	" "
Florida	" "	Ohio	" "
Georgia	(90 semester hours)	**Oklahoma	(90 semester hours)
Idaho	(64 semester hours)	Oregon	Bachelor's Degree
Illinois	Bachelor's Degree	Pennsylvania	" "
Indiana	" "	Rhode Island	" "
Iowa	" "	South Carolina	" "
Kansas	" "	South Dakota	" "
Kentucky	" "	Tennessee	" "
Louisiana	" "	Texas	(at least 60 semester hours)
Maine	" "	Utah	Bachelor's Degree
Maryland	" "	Vermont	" "
Massachusetts	" "	Virginia	" "
Michigan	" "	***Washington	" "
Minnesota	" "	West Virginia	" "
Mississippi	" "	Wisconsin	" "
Missouri	" "	Wyoming	" "
Montana	" "		

* These states require certain specific academic courses

** Oklahoma requires a bachelor's degree in order to receive a life certificate.

*** Washington requires five years of training for teacher certification.

[1] H. Cooper, "New York's Five-Year Program for Prospective Teachers in Secondary Schools," *Teacher Education Journal*, (1:2, 1939-41), pp. 68-76.

pleted a five-year course before he or she can be certified to teach in the secondary schools of that state. It is also one of the states which requires certain specific fields of academic training (other than courses in the theory and practice of physical education). To quote from one of its recent pamphlets on the certification of teachers:

> Applicants for secondary certification must have completed, in a fully accredited college or university, a five-year course designed for the training of secondary teachers and including at least forty-five quarter hours (thirty semester hours), in addition to the number of hours regularly required by the institution for a bachelor's degree.
>
> In this five-year course every applicant must have included at least fifteen quarter hours in contemporary social problems. Courses in current history, political science, economics, and sociology will satisfy this requirement. Courses in Modern History, Education, English, etc., are not acceptable unless a description of the course shows clearly that the field covered is contemporary history or contemporary social problems.[2]

TABLE II

FOUNDATION SCIENCE REQUIREMENTS OF THE 48 STATES FOR TEACHER CERTIFICATION IN HEALTH AND PHYSICAL EDUCATION

(Semester Hours)

State		*State*	
Alabama	No specific requirement	Nebraska	No specific requirement
Arizona	" " "	Nevada	" " "
Arkansas	" " "	N. Hampshire	" " "
California	(15 semester hours)	New Jersey	(6 semester hours)
Colorado	No specific requirement	New Mexico	No specific requirement
Connecticut	" " "	New York	(18 semester hours)
Delaware	" " "	N. Carolina	(8 semester hours)
Florida	(14 semester hours)	N. Dakota	No specific requirement
Georgia	No specific requirement	Ohio	(6 semester hours)
Idaho	" " "	Oklahoma	No specific requirement
Illinois	" " "	Oregon	" " "
*Indiana	(30 semester hours)	Pennsylvania	(21 semester hours)
Iowa	No specific requirement	Rhode Island	No specific requirement
Kansas	(10 semester hours)	S. Carolina	" " "
Kentucky	No specific requirement	S. Dakota	" " "
Louisiana	(9 semester hours)	Tennessee	" " "
Maine	(6 semester hours)	Texas	(12 semester hours)
**Maryland	No specific requirement	Utah	No specific requirement
Massachusetts	" " "	Vermont	" " "
Michigan	(25 semester hours)	Virginia	" " "
**Minnesota	No specific requirement	Washington	" " "
Mississippi	(15 semester hours)	W. Virginia	" " "
Missouri	No specific requirement	Wisconsin	" " "
Montana	" " "	Wyoming	" " "

*Indiana requires 30 semester hours of science and social studies.

** Maryland requires courses in anatomy, biology, and physiology, and Minnesota, in anatomy, physiology, and hygiene.

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2 State of Washington Certification of Teachers and Administrators, May, 1943.

Alabama is another state which has specific requirements which must be included in the general academic training. The questionnaire received from that state mentions specifically that the general academic training must include twelve semester hours of English, six semester hours of history, and six semester hours of social studies.[3]

New Jersey states also that, in addition to a bachelor's degree, the curriculum must have included twelve semester hours of English language and literature, twelve semester hours in the social studies, and at least six semester hours in science. Oklahoma, too, requires that the curriculum must include English, American history and government, and Oklahoma history.

REQUIREMENTS IN THE AREA OF THE FOUNDATION SCIENCES

Results of the questionnaires show that the states are somewhat more specific in the requirements in the area of the foundation sciences. Even there, however, it is found that the range of semester hours, shown in Table II, runs from 0 to 25. Most of the states expect that the individual will get certain of the foundation sciences in meeting the requirements of the major course in physical education; however, the point to be emphasized is that many states do not state specifically just what is expected in this field. It is quite conceivable that many of the schools of higher education, offering major programs of physical education, could have meager offerings in the foundation sciences but still an individual graduating from that institution could be certified to teach physical education in a number of states.

Some states, however, are more specific in these requirements. For instance, California demands a minimum of fifteen semester hours, to be selected from biology, anatomy, physiology, hygiene, psychology, sociology, and chemistry.[4] Colorado suggests that some of the courses included in the training of physical education teachers must be selected from anatomy, physiology, biology, and hygiene. Kansas requires a minimum of ten semester hours in the fields of health, physiology, first aid, and school hygiene. New York is even more specific in that it requires at least eighteen semester hours to be divided as follows: two semester hours in general anatomy, four semester hours in general physiology, six semester hours in biology, two semester hours in hygiene, and four semester hours of elective science.[5]

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3 A semester hour is defined as a subject taken for one hour per week for at least 16 weeks.

4 State of California Bulletin, *Regulations Governing the Granting of Credentials for Public School Service in California*, 1942.

5 *Bulletin of the University of the State of New York.* Albany, New York: The State Education Department, 1935.

TABLE III

PROFESSIONAL EDUCATION REQUIREMENTS IN THE 48 STATES FOR TEACHER CERTIFICATION IN HEALTH AND PHYSICAL EDUCATION

(Semester Hours)

State		
Alabama	15-24	
Arizona	18	
Arkansas	16	
California	15	
Colorado	10	(15 quarter hours)
Connecticut		(No specific requirement)
Delaware	6	
Florida	18	
Georgia	18	
Idaho	15	
Illinois	15	
Indiana	18	
Iowa	15	
Kansas		(No specific requirement)
Kentucky	18	(27 quarter hours)
Louisiana	18	
Maine		(No specific requirement)
Maryland	16	
Massachusetts	12	
Michigan	20	
Minnesota		(No specific requirement)
Mississippi	20	
Missouri	18	
Montana	15	(22½ quarter hours)
Nebraska	18	
Nevada	18	
New Hampshire	12	
New Jersey	18	
New Mexico		(No specific requirement)
New York	18	
North Carolina	18	
North Dakota	16	
Ohio	17	
Oklahoma	18	
Oregon	24	(36 quarter hours)
Pennsylvania	18	
Rhode Island		(400 clock hours)
South Carolina		(No specific requirement)
South Dakota	15	
Tennessee	18	(27 quarter hours)
Texas	18	
Utah	20	(30 quarter hours)
Vermont	12	
Virginia	18	
Washington	16	(24 quarter hours)
West Virginia	20	
Wisconsin	18	
Wyoming	16	(24 quarter hours)

REQUIREMENTS IN THE AREA OF PROFESSIONAL EDUCATION

Courses and semester hours of credit in professional education show a rather wide range, being from 6 to 24, as indicated in Table III. The significant fact is, however, that forty-one of the forty-eight states requires specific work in that field for certification. This indicates the increased importance placed in the field.

The types of courses in professional education required and the terminology used varies a great deal, but mentioned most often are history of education, philosopy of education, principles of education, educational psychology, educational sociology, introduction to teaching, adolescent psychology, psychology for teachers, teaching methods, educational tests and measurements, and directed (practice) teaching.

REQUIREMENTS IN THE AREA OF HEALTH AND PHYSICAL EDUCATION

The specific field of health and physical education indicates even more of a hodge-podge of course requirements and a differentiation of terminology. Table IV shows the range in semester hours to be from 10 to 60. In states such as Connecticut, Nevada, New Jersey, North Dakota, and South Carolina, where definite semester hours are not mentioned, a major in physical education is required. Illinois makes two classifications in regard to requirements in this field: (a) if the individual teaches physical education in a school where it is required for graduation, he must have had sixteen semester hours of work in this field, and four of these semester hours must be in physiology, anatomy, kinesiology, hygiene, health, safety, or other related subjects; (b) if the individual teaches in a school where physical education is not required for graduation, only four semester hours are required in this field.

Indiana designates three divisions within the field of health and physical education in which requirements must be met. The first is that of health and safety education, which must include at least fourteen semester hours. Courses such as hygiene, first aid and safety, organization and administration of the school health program, and physiology and human anatomy fall in this category. The second division is physical education, including such courses as orientation, tests and measurements in health and physical education, and various technical skills, in which twenty-two semester hours are required. Recreation, the third division, includes games, crafts, dramatics, and music. Four semester hours are required.[6]

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[6] *Teacher Education and Certification*. Bulletin, No. 148, Indiana State Department of Public Instruction, 1943.

TABLE IV

REQUIREMENTS IN HEALTH AND PHYSICAL EDUCATION FOR TEACHER CERTIFICATION IN 48 STATES

(Semester Hours)

State		
Alabama	12	
Arizona	30	
Arkansas	24	
California	24	
Colorado	30-2/3	
Connecticut		(Major in health and phys. educ.)
Delaware	60	
Florida	24	
Georgia	12	
Idaho	25	
*Illinois	16	
Indiana	40	
Iowa	26	
Kansas	15	
Kentucky	24	
Louisiana	40	
Maine	12	
Maryland	30	
Massachusetts	18	
Michigan	24	
Minnesota	36	
Mississippi	25	
Missouri	24	
Montana	32	(48 quarter hours)
Nebraska	15	
Nevada		(Major in health and phys. educ.)
New Hampshire	24	
New Jersey		(Major in health and phys. educ.)
New Mexico	10	
New York	36	
North Carolina	30	
North Dakota		(Major in health and phys. educ.)
Ohio	40	
Oklahoma	24	
Oregon	24	(36 quarter hours)
Pennsylvania	30	
Rhode Island		(400 clock hours)
South Carolina		(Major in health and phys. educ.)
South Dakota	15	
Tennessee	14	(21 quarter hours)
Texas	6 to 12	
Utah	20	
Vermont		(Major in health and phys. educ.)
Virginia	12	
Washington		(Minor of 12 semester hours)
West Virginia	24	
Wisconsin	30	
Wyoming	15	(22½ quarter hours)

* Illinois requires four semester hours in this field for teaching in schools where physical education is not required for graduation.

SUMMARY

Tables I, II, III, and IV show the requirements, prior to the war, in the general academic field, the foundation sciences, professional education, and professional health and physical education which are necesary for certification to teach health and physical education in each of the forty-eight states.

It may be seen that there is a wide variation both as to the number of semester hours required and as to specific courses expected. Specifically, these requirements may be summarized as follows:

1. *Academic.*—All but five of the forty-eight states definitely state that an individual must graduate from an approved four-year course to be certified to teach health and physical education. A few of the states specify certain courses in this general area which must be included.

2. *Foundation Sciences.*—The states are not very clear in requirements in this field, but courses in anatomy and physiology are mentioned as basic to a major course in health and physical education.

3. *Education.*—From six to twenty-four semester hours in professional education courses are required for those who plan to teach in health and physical education. Eighteen semester hours are mentioned by the majority of states as a minimum requirement.

. *Health and Physical Education.*—A major in this field seems to be the general requirement; however, the number of semester hours making up this major ranges from ten to sixty. Twenty-four semester hours are mentioned most frequently as a minimum requirement.

PRESENT CONSIDERATIONS

Teacher education is going through a very strenuous period, as is all formalized education. From a four-year period of scarcity of prospective teachers of health and physical education in our training institutions, we suddenly have shifted into a situation which has over-crowded the majority of teacher-training schools, and caused many new ones to spring up. It is easy to see what will be the outcome of such a situation unless drastic efforts are made to maintain exceptionally high standards for teaching in health and physical education. Now more than ever before the states must closely scrutinize each of their colleges and universities which prepare teachers in this area. Is the institution well equipped with an adequate and well trained faculty? Are the equipment and facilities for training prospective students adequate? Are there any standards as to the areas to be dwelt upon in the various courses, or is it deemed sufficient for the prospective teacher to accumulate enough credits to obtain a degree.

These are questions with which the state will have to be concerned, if the profession of health and physical education is to maintain a high level.

The Organization of a Veterans' Physical Education Program

By Charles A. Bucher
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WHAT type of physical education program should be set up for the thousands of veterans who are returning to school? This is a question that is facing many physical educators today as they organize and administer their various school programs. Although physical education men are interested in seeing that ex-servicemen receive the type of program that is best adapted to their needs and interests, they often neglect to let the G.I. help in formulating the program. As a result, many components, techniques, and procedures are often incorporated which are looked on with disfavor by the veteran. His experience has proven them to be boresome and of little value in improving his health and physical fitness. When such conditions exist, it seems that we are failing to contribute to the proper readjustment process which veterans are having to face as they resume school and civilian life once again.

Veterans, as a rule, are mature individuals who have a sound sense of judgment which is based on broad experiences. They have participated in many physical education programs and have formed definite ideas as to what should or should not be used to improve their health and physical fitness. Therefore, it seems wise to let them help us in formulating a program. Through their suggestions, opinions, and ideas, much assistance can be gained in organizing and administering a veterans' physical education program.

With this thought in mind, the writer conducted a survey among aviation cadets in the Army Air Forces. This survey covers only one branch of the armed services and is not intended to be representative of all armed services. However, the opinions expressed here may be compared with informal statements made to other athletic officers as a general check on the universality of the opinions given in this survey.

The survey was conducted at the Advanced Twin-Engine School at Turner Field, Albany, Georgia, in August and September of 1944. Two hundred aviation cadets were interviewed and their opinions and suggestions recorded. After having attended regular physical training

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This paper is based on an aviation cadet appraisal of the Army Air Forces physical training program.

classes in the college training detachments, classification centers, and preflight, primary, basic, and advanced flying schools, these trainees, at the time of the interview, were ready to receive their wings and be commissioned second lieutenants or flight officers in the Army Air Forces. All of these servicemen had a high school education, with approximately sixty percent having completed in addition an average of two years of college work.

The questions and answers in this survey which are pertinent to the organization and administration of a veterans' physical education program follow:

Question: Have you enjoyed physical training while in the Army Air Forces?

Yes	56.5%
No	19.0%
Undecided	24.5%

Question: At what stage in your training do you feel they had the best physical training program?

Preflight	38.5%
Primary	38.5%
Basic	8.5%
Advanced	14.5%

Factors which influenced their decisions:

1. A vigorous and tough program that got them into good physical shape.
2. An interesting and varied program.
3. Good equipment.
4. Good organization.
5. Calisthenics administered in a quick and precise manner.
6. Good instructors.
7. Ample time to shower and dress.

Question: Do you think you need a minimum of six days per week, one hour per day, of physical training to keep in good physical shape?

Yes	57.0%
No	43.0%

Approximately one-half of the 43 percent who said "No" considered five days per week, one hour per day, as a minimum.

Question: What is your opinion of the components of the required physical training program?

A tabulation of answers given by trainees is shown in Table I.

TABLE I

A. Aviation Cadets' Opinions of the Components in the Required Physical Fitness Program

Component	*Liked*	*Disliked*	*Undecided as to Whether It Was Liked or Disliked*	*Resulted in Better Physical Condition*
Calisthenics	42.0%	51.0%	7.0%	87.0%
Dumbbells	23.0%	68.0%	9.0%	69.5%
Wands	44.5%	50.0%	5.5%	53.5%
Grass Drills	28.0%	55.0%	17.0%	48.5%
Guerrilla Activities	32.0%	20.0%	48.0%	28.0%
Cross Country (flat)	54.5%	35.5%	10.0%	74.5%
Steeplechase	29.5%	24.0%	46.5%	33.5%
Obstacle Course	58.5%	34.0%	7.5%	68.5%
Wind Sprints	35.0%	57.0%	8.0%	60.0%
Relays	67.0%	26.0%	7.0%	60.5%
Deploying Tactics	25.5%	25.0%	49.5%	22.0%
Basketball	94.0%	3.5%	2.5%	74.0%
Touch Football	94.5%	3.0%	2.5%	71.0%
Softball	96.0%	2.0%	2.0%	67.5%
Soccer	60.5%	8.5%	31.0%	44.5%
Speedball	50.5%	7.0%	42.5%	37.5%
Volleyball	96.5%	2.0%	1.5%	65.0%
Water Polo	60.0%	6.0%	34.0%	42.5%
Pushball	41.5%	20.0%	38.5%	31.0%
Handball	78.0%	7.5%	14.5%	33.5%
Tennis	81.5%	6.5%	12.0%	54.5%
Military Aquatics and Water Safety	74.5%	15.0%	10.5%	60.5%
Hand to Hand Fighting	48.0%	18.0%	34.0%	35.0%
Bag Punching	59.0%	12.0%	29.0%	44.5%
Military Tumbling and Gymnastics	60.0%	20.5%	19.5%	52.5%
Track and Field	62.0%	21.5%	16.5%	53.5%
Archery	34.5%	9.0%	56.5%	19.0%

In some cases the trainee did not know whether a component was liked or disliked, because he did not have the opportunity to participate in all activities.

B. Components Ranked in Order in which They Improved Physical Condition According to Cadets

1. Calisthenics
2. Cross Country (flat)
3. Basketball
4. Touch Football
5. Dumbbells
6. Obstacle Course
7. Softball
8. Volleyball
9. Relays, Military Aquatics and Water Safety
10. Wind Sprints
11. Tennis
12. Track and Field, Wands
13. Military Tumbling and Gymnastics
14. Grass Drills
15. Soccer, Bag Punching
16. Water Polo
17. Speedball
18. Hand-to-Hand Fighting
19. Handball, Steeplechase
20. Pushball
21. Guerrilla Activities
22. Deploying Activities
23. Archery

C. Components Liked by More Than Eighty Percent of Trainees

Component	*Percentage*
Volleyball	96.5
Softball	96.0
Touch Football	94.5
Basketball	94.0
Tennis	81.5

Question: What five games did you like best during your flight training? List in order of preference.

To determine how these games should be ranked, each game placed first was awarded five points; second, four points; third, three points; fourth, two points; and fifth, one point. In Table II are ranked the first ten games to place.

TABLE II

Games Ranked in Order of Preference

	Game	*Total Votes Cast*
1.	Basketball	627
2.	Volleyball	595
3.	Softball	508
4.	Touch Football	493
5.	Tennis	298
6.	Paddle Tennis	46
7.	Water Polo	39
8.	Soccer	34
9.	Speedball	21
10.	Handball	17

Question: Do you think the AAF physical fitness test is a good indication of your physical fitness?

Yes	45.5%
No	54.5%

Question: Have you been interested in improving your physical fitness rating?

Yes	85.0%
No	15.0%

Question: If answer was "yes" to above question, why have you been interested in improving your physical fitness rating?

1. Some of these individuals stressed the fact that it signified they were in better physical condition (39.4%).

2. Some stated that self-satisfaction was the reason they wanted to get a higher rating (28.8%).

3. Some said they were interested in improving their rating in

order to avoid taking the test over, which they stated was a practice at some stations when their scores did not indicate improvement (16.6%).

4. Some liked competition and wanted to get a higher score than the other members in their class (12.3%).

5. Some did not feel that a higher PFR score indicated they were in better physical condition, but thought that if their PFR record showed an improvement it might help to make the difference between a blue and a gold bar upon graduation (2.9%).

Question: If answer was "no" to question, why haven't you been interested in improving your physical fitness rating?

1. Some thought a higher physical fitness rating was not an indication of better physical condition (50%). (Some individuals thought there were too few test items and that it favored the individual of small stature.)

2. Some listed various reasons (26.7%) such as "I can't run fast nor do many chinups, yet I am in good physical condition"; "After taking PFR, I can't do anything else for a week"; "I am satisfied with my present physical condition"; "I'm too lazy"; "It leaves you all sore and nervous for about four days; "Because I was forced to do it."

3. Some said they were not interested in improving their physical fitness score as long as they felt good and thought they were in good physical condition (23.3%).

Question: What changes would you recommend for future programs of physical education?

The answers to the above question have been summarized in the following statements.

1. Some time to be devoted to "free play," in which each individual is allowed to choose that activity in which he desires to participate.

2. Calisthenics not to be given for more than ten to fifteen minutes at one time.

3. A competitive sports program.

4. Teaching of skills with a "carry over" value for later life.

5. More emphasis on the swimming program.

6. Modified programs to be conducted for all individuals having orthopedic defects.

7. Schedule arranged so that ample time is allotted for showering and dressing.

8. Less stress to be placed on the importance of obtaining a high score in the physical fitness test.

9. Facts as to the validity of physical fitness test to be publicized.

10. A physical fitness test that indicates physical condition accurately.

11. An orientation program to show the importance of physical fitness.

12. Less discipline in physical education classes.

13. More tumbling to be included in the program.

14. Teaching of art of self-defense to be included in the program.

15. A varied schedule of activities that takes into consideration the needs and interests of the individuals participating.

A Study Of The Physical Inspection Programs For Girls In Colleges And Universities Of The Midwest District

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PURPOSE OF THE STUDY

THE purpose of this research was to study the anthropometric and orthopedic measurement programs for college girls in the midwest district.

PROCEDURE

The study involved the securing of physical inspection forms now being used, information concerning procedures used, the use of the results of the inspection for classification into corrective groups, and type of follow-up work.

An introductory letter requesting physical inspection forms used in departments of physical education was sent to 107 colleges and universities listed in the directory of the Midwest Association of College Teachers of Physical Education for Women. From 89 replies, it was found (a) that 23 colleges used physical inspection forms, (b) that 10 colleges used combination medical examination and physical inspection forms, (c) that 8 colleges used no forms but did administer physical inspections, and (d) that 48 colleges used only medical examination forms.

The questionnaire was then devised and sent to all those colleges and universities which replied to the introductory letter. The questionnaire covered the following material: (1) time of administering the inspection, (2) methods of inspecting feet and posture, (3) use of weight norms in determining overweight and underweight, (4) classification of students into corrective groups, (5) use of specific follow-up procedures for abnormal feet, poor posture, overweight and underweight girls, and (6) use of conferences as a follow-up procedure. Fifty-five of these questionnaires were returned. Data from those 33 schools which gave a physical inspection or a combination medical examination and physical inspection were used to obtain information concerning procedures used and the use of the results of the inspection for classification into corrective groups. Data from

all returned questionnaires were used to determine type of follow-up work.

A rating sheet was devised, including items on the questionnaire and physical inspection forms, and submitted to a group of selected physical educators who had agreed to act as judges.[1] The judges were requested to check items recommended as bare essentials for a physical inspection program and items recommended for a complete physical inspection program. The evaluations of the individual items by the judges were then compared with evaluations of these items as determined by the frequency of occurrence in the various programs.

RESULTS OF THE STUDY

Physical Inspection Forms

In only 33 departments of physical education of the 89 schools which answered the introductory letter, was a physical inspection or combination physical inspection and medical examination form used.

There was little uniformity in the items included on the physical inspection forms. Anterior and longitudinal arches were used in the inspection of feet of from 20 to 33 forms. Head, shoulders, abdomen, kyphosis, and lordosis were used in the inspection of anterior-posterior posture in from 20 to 33 forms. Shoulders were included in the inspection of lateral posture in from 20 to 33 forms. Weight and standing height were anthropometric measurements used in from 20 to 33 forms. All other items were found on less than 20 of the 33 forms.

There was little agreement among the judges as to the items which should be included in the essential inspection program, but there was general agreement as to items which should be included in the complete inspection program.

The data also indicated that there was little agreement between items included in the physical inspection program of these colleges and the items recommended by the judges for the essential program.

Questionnaires and Judges' Ratings

1. *Time of administering the inspection.*—Both judges and schools most frequently agreed that inspections should be administered during the first semester of the freshman year.

2. *Methods of inspecting feet and posture.*—For the inspection of feet, the method most frequently used by the schools and most often recommended by the judges was subjective judgment.

For the inspection of posture, the method most frequently used

[1] The judges were Miss Emily Andrews, Miss Althea Heimbach, Dr. Gertrude Moulton, Miss Margaret Phillips, Dr. Josephine Rathbone, Mrs. Marica Reisser, and Miss Marion Russell.

by the schools was subjective judgment. The judges recommended that some method be added to that of subjective judgment in the examination of posture. C-ray[2] and the plumb line test were each added to subjective judgment by two judges. Photographs were added most frequently to subjective judgment by the judges for the complete inspection program.

3. *Use of weight norms.*—All schools measured height and weight. Only 15 schools, however, used these measurements in determining overweight and underweight. Although five of the judges did recommend methods to be used in determining overweight and underweight, there was no agreement as to which method should be used.

4. *Classification of girls into corrective groups.*—There was little agreement among the judges and the schools concerning which items should be used for classification of girls into corrective groups. The items used were feet, posture, weight norm, doctor's recommendation, faulty body mechanics, recent illness, physical handicaps, and anthropometric measurements.

5. *Follow-up procedures.*—Forty-seven of the 55 schools which returned questionnaires used follow-up procedures for abnormal feet, 38 for poor posture, 39 for overweight girls, and 37 for underweight girls. The schools most frequently used a special exercise program and advice for proper shoes as follow-up procedures in the instance of abnormal feet. The judges recommended a special exercise program, reference to a doctor, and corrective classes for the essential follow-up program. The judges recommended advice for proper shoes in addition to procedures just mentioned for the complete follow-up program.

The schools used and the judges recommended that some form of exercise should be given to girls receiving low posture grades.

The schools used and the judges recommended reference to the medical department and supervision of exercise and nutrition as follow-up procedures for overweight girls.

The schools used and the judges recommended reference to the medical department and supervision of exercise, rest, and nutrition as follow-up procedures for underweight girls.

6. *Conferences.*—Conferences with girls as part of the follow-up program were treated more in detail in this study. Inquiry was made

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2 This is a constant light ray developed at Nela Park, Cleveland, Ohio, invented and patented by Jack McGarth. It shows a non-distorted analysis of posture where the true image is projected upon a translucent self-grading chart. Scoring is on the basis of 100 percent, and correctional exercises were worked out by Emily R. Andrews, Helen W. Smith, and Jack McGarth. The system is used at Mather College, Western Reserve University. It was copyrighted in 1947.

concerning (a) the members of the physical education staff holding these conferences, (b) the girls with whom conferences were held, (c) the problems involved, and (d) the time of holding conferences.

In the schools and in the judges' recommendations, the director and selected staff members most frequently held conferences with students.

Schools and judges gave varied reasons for holding conferences. The most frequent reason given was for girls whose physical activity was prohibited or limited by doctor's recommendation.

The problems most discussed during the conferences by the schools and most frequently recommended for discussion by the judges were physical condition, physical education program, and health habits.

The schools did not agree on the time for holding the conference. Five judges recommended that the conferences should be held whenever necessary.

Research Abstracts

PREPARED FOR THE
National Council of the Research Section
By GRANVILLE B. JOHNSON

PHYSICAL ANTHROPOLOGY

Stout, David B., "Further Notes on Albinism Among the San Blas Cuna, Panama," *Am. J. Phys. Anthrop.*, 4:4 (December).

The Cuna Indians of eastern Panama have long been known to exhibit a remarkably high degree of albinism. Reginald G. Harris made a scientific field study in 1925 among the San Blas Cuna, the largest portion of the tribe. On the basis of genealogies and anthropometric study he concluded the albinos to be partial or imperfect albinos who expressed a homozygous recessive condition, and the result of a mutation in one or more genes rather than miscegenation with Caucasians. He estimated an incidence of .69 ± %, and suggested that the social organization allowed a high degree of inbreeding which permitted the propagation of albinos by phenotypically normal Cunas. In 1940 the present author confirmed Harris' genealogies and, on the basis of more accurate total population data and count of albinos, refined the incidence to .47 ± %. The author also describes the religious attitudes toward and social status of the albinos, and, by outlining the structure of San Blas Cuna society, explicitly shows how the inbreeding necessary for the establishment and continuation of this genetic phenomenon has been brought about.—*The Wistar Institute.*

Strandskov, Herluf H., "An Analysis of the Sex Ratios Among Single and Plural Births in the Total, the White and the Colored U.S. Populations," *Am. J. Phys. Anthrop.*, 4:4 (December).

The sex ratios among single, twin, triplet, and quadruplet births within the total, the white, and the colored U.S. population from 1922 to 1936 inclusive are presented. It is shown that the percentage of male births decreases significantly with each increase in number of embryos per pregnancy. Two explanatory hypotheses are suggested. One is that with increased competition the male embryo tends to be eliminated early to a greater extent than is true for female embryos. The other is that female determined zygotes tend to twin, triple, or quadruple to a greater extent than do male determined zygotes. The first hypothesis is favored. It is found that the percentage of males among live births and stillbirths combined is significantly lower among single, twin, triplet, and quadruplet births within the colored population than among the corresponding births of the white. These racial differences probably are due primarily to racial genetic factors but probably also to some extent to racial environmental factors. The percentage of males among colored single stillbirths is significantly larger than that among white single stillbirths. This racial difference probably is due largely to racial environmental differences.—*The Wistar Institute.*

Thurstone, Louis L., "Factorial Analysis of Body Measurements," *Am. J. Phys. Anthrop.*, 5:1 (March).

There has been a recurring interest in the problems of body types in which attempts have been made to relate these types to the incidence of physical and mental disease, and to temperament. It is a question that can be described in terms of a small number of parameters, factors, or types, whatever the extremes may be called. This is exactly the kind of problem for which multiple factor analysis was designed. The present paper is a re-analysis of a set of eighteen body measurements which can be described as linear combinations of seven

underlying factors which can be given tentative interpretations. The interpretation of these factors should be checked with factorial results for larger sets of body measurements by which the nature of each factor should be clarified.

Weidenreich, Franz, "Generic, Specific, and Subspecific Characters in Human Evolution," *Am. J. Phys. Anthrop.*, 4:4 (December).

The discussion centers around the question as to whether the morphological characters recognizable in human evolution permit a clear objective distinction between genus, species, and subspecies. It is concluded that all the hominids, living and fossil—the latter so far as they are known today—represent only one species. The dissimilarities between the different groups are no greater than those found among subspecific variants and never rise above a subspecific level. Therefore, there is no justification for exaggerating these differences by nomenclature. Human evolution presents a typical example of "progressive evolution" or correlated changes which succeed each other, but do not appear synchronously or in a fixed order. In addition to the correlated characters which concern the fundamental organization, there are others which are of secondary importance from the phylogenetic point of view. These involve in particular, the exterior (skin and physiognomy) and may be combined with any phase and variation of the fundamental organization.

Bayley, Nancy, and Leona M. Bayer, "The Assessment of Sumatic Androgyny," *Am. J. Phys. Anthrop.*, 4:4 (December).

A rating scale has been devised for assessing somatic androgyny in almost mature boys and girls. Standards are presented by body photographs, descriptions, and a rating chart for constructing individual profiles. Subjects are rated according to degree and direction of sexual differentiation. Agreement between independent raters shows the scale to be reliable. Scores fall into a bi-modal continuum with small amounts of overlapping of sexes. Cases with intermediate scores may be either undifferentiated (asexual), or show characteristics of the opposite sex (bisexual). Androgyny appears to be truly a "mosaic," as Draper so aptly labeled it. Valid sex differences, having little or no overlap between masculine and feminine scores are almost entirely independent of each other within a sex. Many individuals may deviate in a few characteristics; few will deviate in many. With standards for assessing somatic androgyny it should be possible to determine its relation to personality structure. Significant personality differences may well be found between those with normal builds; with relatively immature builds; with build characteristics of the opposite sex. Perhaps androgyny scores will also prove useful in relating sex variations in physique to other aspects of body build, to physical fitness, and to hormone assays.

PHYSIOLOGY

Dempsey, Edward W., and George B. Wislocki, "Further Observations on the Distribution of Phosphatases in Mammalian Placentas," *Am. J. Anat.*, 80:1 (January).

Phosphatases which split adenylic acid, fructose diphosphate, glycerophosphate, lecithin, and yeast nucleic acid have been demonstrated histochemically in the placentas and adjoining maternal tissues from the guinea pig, cat, sow, and woman. The syncytial trophoblast of the guinea pig and human placenta contains phosphatases capable of splitting all of these substrates. Various of the other tissues exhibit apparent specificity in that reactions are given with only one, or, at most, several substrates. Thus, the cytotrophoblastic cells of the human placenta exhibit alkaline phosphatase reactions with fructose diphosphate and nucleic acid, but not with glycerophosphate or lecithin. Likewise, the uterine glands of the pregnant sow are rich in acid phosphatase

when incubated in glycerophosphate, adenylic acid, and nucleic acid, but are negative when tested with frustose diphosphate and lecithin. The guinea pig's yolk sac, the cat's paraplacental chorion and the chorionic areolae of the sow are analogous in that all three structures appear to absorb iron and phosphatase which have been secreted by the uterine glands into the uterine lumen. Increased amounts of acid and alkaline phosphatase, as determined with each of the substrates, occur in the human placenta of eclampsia. Only weak activity is encountered in hydatidiform mole.—*The Wistar Institute.*

Wells, Katharine F., "A Manual of Kinesiology: A Course of Study with Supplementary Illustrative Material, Classified Reference Lists and Laboratory Exercises," doctoral dissertation, Iowa State University (1946).

The author states that one function of this manual is to enrich the kinesiology course by providing supplementary material based in part on investigations in the medical literature, and in part on investigations made by the writer.

Her original investigations include the following: (1) line-of-gravity study (the Lovett technique for determining the location of the line of gravity was adapted to photographic measurement of a variety of subjects under differing conditions); (2) range of joint motion (range and median of movements in shoulder, hip, and ankle joints were reported); (3) x-ray study of scapular movements (one subject was studied intensively, and the method reported unsatisfactory because of the element of distortion in the x-rays; (4) relative strength of the elbow flexors used in three positions of the forearm—supination, pronation, and mid-position (supination was found to be the most favorable position and pronation the least favorable for action of the elbow flexors in a grip dynamometer test of a number of subjects); (5) muscular analysis of the fundamental joint movements (in studying the action of the muscles associated with the fundamental movements of the joints, the writer synthesized the findings of five authorities, then tested each movement on a subject); (6) action current study of a pectoral stretching exercise (action current was noted on each subject, in each of three methods of stretching; the intensity was greatest, however, when the stretching was applied suddenly and forcefully).—*Dr. Elizabeth Cobb.*

EMBRYOLOGY

Meyer, Robert, "Normal and Abnormal Development of the Ureter in the Human Embryo—A Mechanistic Consideration," *Anat. Rec.*, 96:4 (December).

1. The development of the ureter is a coherent totality induced by a single continuous impulse physically considered as an active reciprocal repulsion between the ureter and the Wolffian duct during the differentiation synonymous with alienation. The progressive specialization acquired by the phylogeny is responsible for the strange course of the ureter during the development. The inherent tendency of the ureter to become independent from the Wolffian duct is satisfied by the delivery to the bladder and the further removal from one another. This is made possible by the local reversion of the orifices including the Wolffian pit and the trigonum anlage. By these means, the Wolffian ducts ejaculate the semen not in the urine, and the Mullerian vagina between the Wolffian ducts opens to the outside in the vestibulum. The ureter starts always from the knee of the Wolffian duct between the longitudinal and the ventrally bent part.

2. Anomalies: A complete trigonum contradicts the supposition of an ectopic ureteral orifice but suggests the occlusion of the ureter if an orifice is missing. The ectopy of the ureter orifice is caused by inadequate differentiation or alienation from the Wolffian duct and by the not-far-enough cranially

reaching dilatation of the common end of both ducts. This can happen when the ureter starts uncommonly high from the Wolffian duct following a change in the site of the "knee."—*The Wistar Institute.*

Pearson, Anthony A., "The Development of the Motor Nuclei of the Facial Nerve in Man," *J. Comp. Neur.*, 85:3 (December).

After the motor cells of the facial nerve have migrated to a ventrolateral position in the brain stem, they form a mass which subsequently becomes divided into groups or columns of cells. The main mass of cells and its subdivisions constitute the ventral or chief motor nucleus. At approximately the beginning of the fourth fetal month the chief nucleus becomes divided into three columns of cells: a dorsal, a ventral, and an intermediate group. During the fifth month a small group of large multipolar neurons becomes separated from the ventrolateral border of the chief nucleus, a less distinct group of neurons from its ventromedial border, and another group appears along its medial side. The accessory facial nucleus is an inconstant group of cells located midway between the abducent nucleus and the chief motor nucleus of VII. The cells of this nucleus are often arranged in several clusters. During the later months of fetal development these cell groups are well defined and they can be identified in the brain of the baby and the adult with only minor variations. —*The Wistar Institute.*

ANATOMY

Lassek, Arthur M., "The Human Pyramidal Tract," *J. Comp. Neur.*, 85:3 (December).

In a series of eleven selected cases which had epilepsy clinically, a low intelligence level and practically complete motor paralysis with pronounced cytoarchitectural malformations pathologically, the pyramidal tract neurons were judged to be normal in respect to number and diameter of fibers in the majority of pyramids. Only one case exhibited overt degeneration of pyramidal neurons and this had an additional organic lesion to account for the loss. Pyramidal axons can develop normally in the presence of severe, congenital cytological malformations in the cerebral cortex. Such motor deficits as inability to sit, stand, or walk, over a period of years is compatible with morphologically normal-looking fibers in the pyramids which may conduct impulses under abnormal physiological conditions causing convulsions.—*The Wistar Institute.*

Manter, John T., "Distribution of Compression Forces in the Joints of the Human Foot," *Anat. Rec.*, 96:3 (November).

A static load was applied at the talus, and the resulting compressions in the joints were studied in ligament preparations of cadaver feet. The supporting pressure under the sole of the foot was also measured. Results indicate that under specified loading conditions ligaments can support the joints independently and allow normal weight-bearing under the foot. The proximal joints registered the largest compressions corresponding with the intensity of bending movement acting in that region of the foot. Compression stress was emphasized along the medial border of the foot in a zone following the crest of the longitudinal and transverse arches. Crosswise compression found between bones of the transverse arch indicates that this arch may tend to flatten under a bending load.—*The Wistar Institute.*

Toncray, Jean E., and Wendell Krieg, "The Nuclei of the Human Thalamus: A Comparative Approach," *J. Comp. Neur.*, 85:3 (December).

In spite of the intense recent interest in the thalamic nuclei and their connections, the human thalamus has been seldom studied, and a wax-plate reconstruction of the many component nuclei has never been presented. This study is

based on a dissectible reconstruction of the nuclei from a series of transverse sections stained alternately for fibers and cells. Cell type was used as the chief criterion in nuclear differentiation, and the designations given the nuclei are those which conform best to the ones used in recent work on the primate thalamus. In all, thirty-one nuclear subdivisions are recognized and reconstructed, and there is close agreement with the pattern in the chimpanzee. The subdivisions of the midline group and the nuclei of the internal lamina are very conservative, both in regard to identity and degree of development. The medial nucleus is not subdivisible. Of the anterior nucleus, only the ventral division persists in man. On the other hand, the ventral group has eight parts, while the lateral group has four parts.—*The Wistar Institute.*

EDUCATION AND RECREATION

Buff, Ernest, "Recreation Programs in Public Housing Facilities," *Recreation,* 40:9, 469-470 (December).

A survey of seventy-six housing projects in fifty-one cities located in twenty-one states and the District of Columbia was made. The survey was based upon the operation of community facilities and programs from July 1, 1944, to July 1, 1945.

The more popular programs on the sites of the housing developments were found to range as follows: recreation—67, sports and physical activities—65, civilian defense activities—63, youth organizations—52. The less popular programs were welfare services—20, adult organizations—17, civic activities—16, consumer service—16, and public school programs—6.

In the recreation programs social dancing—52, informal play—48, and motion pictures—45, were the more popular activities. The more popular activities in the sports programs were softball—48, ping pong—46, and basketball—39.—*Carolyn W. Bookwalter.*

Graham, Alva W., "Do Teachers Who Use Democratic Methods Develop Democratic Attitudes?" *The Elementary School Journal,* 47:1 (Sept., 1946).

The experiment in Portland, Oregon, was planned to determine whether different outcomes in terms of selected attitudes would be produced by two contrasted factors: (1) the teacher and his personality, and (2) the methods he employs.

Two groups of nine teachers each were matched in terms of ability and revealed attitudes and opinions but they used different teacthing methods. The experimental group was differentiated as using democratic methods and the primary concern: personality development of pupils. The control group members were differentiated by using autocratic control and the primary concern: subject matter.

Mort and Cornell's *A Guide for Self-Appraisal of School Systems* was used at the beginning and at the end of the four months' period.

The actual mean differences in scores were small but all were in favor of the experimental group. Statistically significant differences were registered in attitudes toward liberal social actions, attitudes toward the defined groups, attitudes related to personal adjustment, and attitudes related to helpfulness toward small children.—*Carolyn W. Bookwalter.*

PSYCHOLOGY AND PSYCHIATRY

Bonney, Merl E., "A Study of the Sociometric Process Among Sixth-Grade Children," *The Journal of Educational Psychology,* 37:6, 359-372 (September, 1946).

One hundred sixth-grade children were asked to list the names of other children in their respective rooms (1) with whom they played most often, and

(2) whom they would prefer to have on their side for a Quiz Kid competition on the war and other topics. A sociometric analysis indicates the greater socializing value of play as compared with an intellectual or academic activity such as the Quiz Kid program, according to the author. It is suggested that one of the best ways to help an individual who is low in social acceptance would be to teach him to play various games, since it is through such activities that he is most likely to establish some degree of acceptance with those who are already socially preferred individuals. Academic prestige, in this study, was no guarantee of superior acceptance in a social relationship.

The analysis is based on the number of times each child was chosen by other children, and on the number of reciprocated and unreciprocated choices in each of the two lists of names being studied. It is a basic assumption of the study that frequency of selection and frequency of reciprocated choices in both lists, is desirable.

Hartman, George W., "The Effects of Noise on School Children," *The Journal of Educational Psychology,* 37:3, 149-160 (March, 1946).

Hartmann reviews and interprets the literature on noise and its relation to performance in school and in industrial situations. The evidence indicates the deleterious effects of certain types and intensities of noise on the human organism, and the lowering of efficiency in mental work.

The author recommends that in the interests of more effective classroom teaching, architects and educators should work together to design school buildings which shall be as free as possible from unwanted noise.

Lund, Frederick, Earl Yeomans, and Ellwood Geiger, "Health Indices in Relation to Age, Sex, Race, and Socio-Economic Status," *Journal of Social Psychology,* 24, 111-118 (August, 1946).

This is a combined report of data revealed in surveys made of health of pupils in the Philadelphia public schools in 1930, 1936, and 1942. The enrollment of the Philadelphia schools is normally above a quarter of a million pupils.

From the standpoint of incidence, dental decay heads the list of incidence, reaching its highest incidence at the pupils' turn of puberty, and then declining slowly. Diseased tonsils and nasal obstructions reached their highest incidence at a relatively early age, declining rapidly during adolescence and early adulthood. Girls showed slightly higher average incidence of most diseases than did the boys. Incidence of defects appeared most closely related to socio-economic level.

As to race, no very striking differences were evidenced until the adult period when the negroes showed a greater army rejection rate than whites for venereal disease.—*Carolyn W. Bookwalter.*

Peters, Henry N., "The Mirror-Tracing Test As a Measure of Social Maladjustment." *Journal of Abnormal and Social Psychology,* 41:4 (October, 1946).

Mimeographed six-pointed star patterns, formed by two sets of parallel lines ¼" apart, were used in the experiment. Five trials for tracing between the path lines were allowed. The first trial was allowed without the mirror but the last four were made while looking in the mirror.

Five groups were tested: Group I—associates of the author (40); Group II—graduate students who were formerly teachers in public schools (51); Group III—men prisoners in a state penitentiary (54); Group IV—adolescents referred to clinics after some social difficulty (58); Group V—inmates of a hospital for the insane (29).

Mirror tracing was found to be valuable as a means of exposing subjects' patterns of emotional responses. Averages of time scores showed that the

socially maladjusted subjects tended to solve the problem more slowly than did socially adapted subjects.—*Carolyn W. Bookwalter.*

Stern, Kar, and Miguel Prado, "Personality Studies in Menopausal Women," *American Journal of Psychiatry,* 103:3, 358-368 (November, 1946).

Fifty patients who attended the medical gynecological outdoor departments of the McGill University and the Allan Memorial Institute of Psychiatry were studied.

In ten of the cases there was no cessation of menses but diagnosis was made on the basis of clinical symptoms, gynecological examinations, and laboratory data. Hot flushes were present in every case. Next in frequency were headache, abdominal discomfort, backache, and painful sensations in the limbs.

Forty-one of the patients complained of being depressed. Of these, ten gave a history of marital maladjustment. Sixteen complained of psychic tension. No correlation was found between the intensity of hot flushes and the severity of emotional disturbance. It was found that the women who had had emotional disturbances in their history, however, had difficulty during menopause.—*Carolyn W. Bookwalter.*

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THE Editorial Committee has approved the following policies for the publication of material in the *Quarterly:*

1. Manuscripts should be sent to the Editor who will see that each one is read by at least two members of the Board of Associate Editors. The Editor will advise the author as to the suitability of the paper or the desirability for revision.

2. Papers are not judged by arbitrary standards of length but on their content of new research results in the field of physical education, health education, and recreation, presented with the greatest brevity compatible with scientific accuracy and clarity.

3. Since manuscripts will not be insured against loss or damage, authors are expected to retain duplicate copies of all material submitted.

4. An original typewritten copy of the manuscript should be submitted. The content should be double spaced with a margin of 1½ inches on each side.

5. The author may include either a list of references at the end of the article or he may put them in footnotes or these two methods may be combined. Book publishers and periodicals do not always agree on the exact order of details in the preparation of references. Also, authors do not always include all the necessary information in references. For authors who have not published extensively a simplified form of magazine and book reference is shown. If a formal bibliography is included with the paper a simple footnote may be used as shown:[1]

1 Katherine B. Crisp, *Health for You*, p. 520.

In this case the footnotes are placed on each page and the bibliography is set up alphabetically and placed at the end of the article. The latter should show the facts of publication, i.e., edition if any, place published, publisher, date.[2,3]

2 Stern, Francis. *Applied Dietetics.* Baltimore, Md.: Williams and Wilkins Co., 1943. (form for book reference in a bibliography)

3 Corbin, H. D., "Current Problems in Recreation," *Journal of Health and Physical Education,* 15:6 (June, 1944). (form for magazine reference in a bibliography)

Note that the main items in a book reference are set off by periods while those in a magazine reference are set off by commas. These two types of references may be combined in what are called bibliographical footnotes which are placed on the corresponding pages as the article progresses. These are set up exactly as footnotes 2 and 3 except that page numbers are added at the end and, in this case, it is not necessary to put the author's last name first.

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4 Kraines, S. H., and E. S. Thetford. *Managing Your Mind.* New York: The Macmillan Co., 1944.

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Although this form is preferred in the *Quarterly*, authors may submit articles with references prepared differently provided the essential information is given and the style used is that of well known journals.

There are many sources of information relative to the preparation of manuscripts for publication. A good source is *A Manual of Style* (10th Edition), Chicago, University of Chicago Press, 1937.

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Massachusetts (3): (No report)

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Minnesota (2): (No report)

Missouri (3): (No report)

Nebraska (1): (No report)

North Dakota (1): (No report)

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Florida (1): (No report)
Georgia (2): Gertrude Manchester, Georgia State College for Women, Milledgeville; Thomas E. McDonough, Emory University.
Kentucky (1): (No report)
Louisiana (2): J. Q. Long, University High, Baton Rouge; Simon A. McNeely, Department of Education, Baton Rouge.
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Utah (1): (No report)

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American Physiotherapy Association: Esther Gilman, Ohio State University, Columbus, Ohio.
American School Health Association: C. H. Keene, University of Buffalo, Buffalo, New York.
Boys' Clubs of America, Incorporated: Walter M. Hall, 381 Fourth Avenue, New York, New York.
Canadian Physical Education Association: A. S. Lamb, McGill University, Montreal, Canada.
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